AUGUST, 1960

TRAFFIC ENGINEERING

Chicago's Automated Sign Shop

Simulation—Its Application to Traffic Engineering

Uniform Traffic Control Devices for Canada

Sioux City Upgrades Traffic Control

INSTITUTE OF TRAFFIC ENGINEERS
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This is Florida . . . the beautiful City of West Palm Beach. You're on South Flagler Drive . . . approaching Lake View Avenue and Royal Park Bridge.

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P-160

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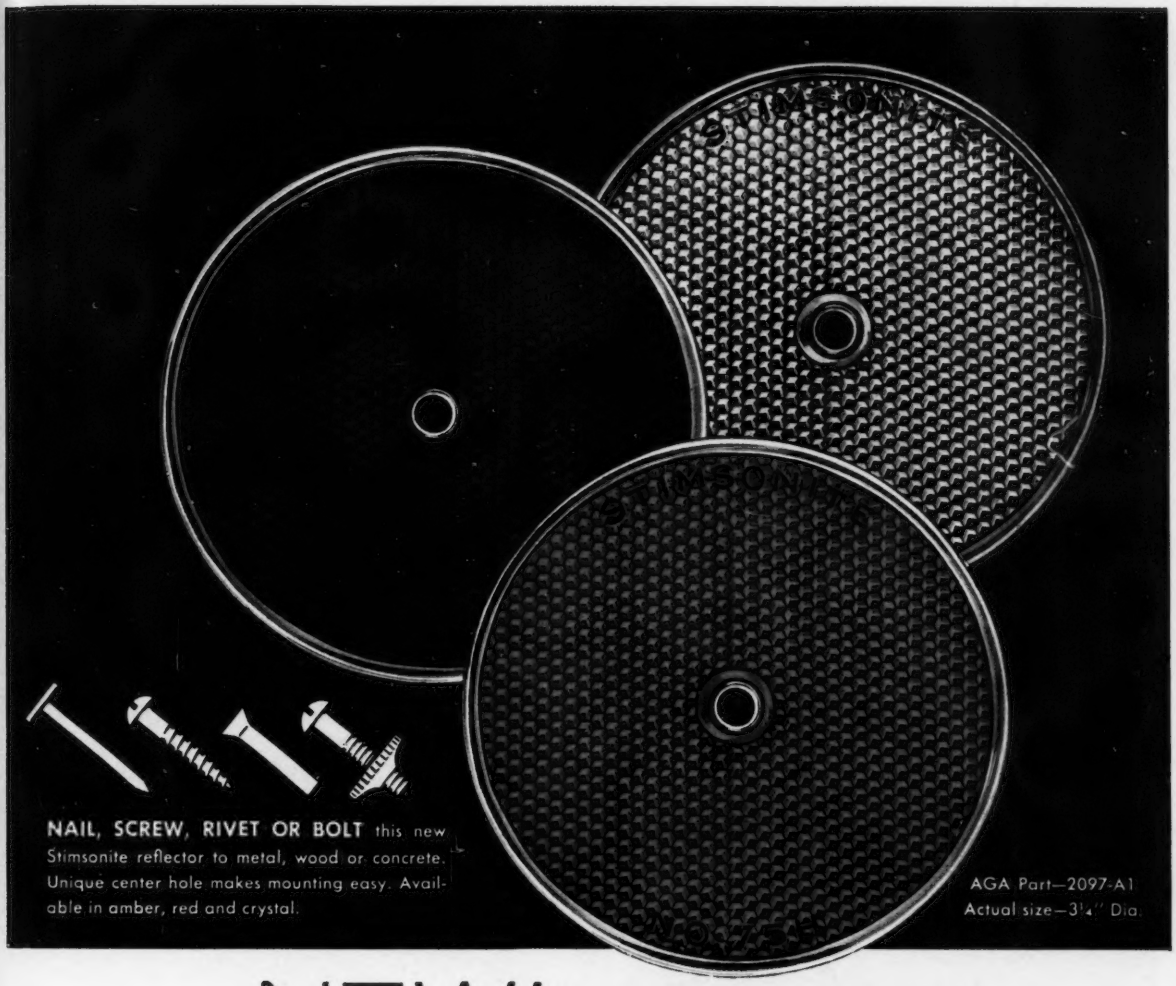
NAIL, SCREW, RIVET OR BOLT this new Stimsonite reflector to metal, wood or concrete. Unique center hole makes mounting easy. Available in amber, red and crystal.
AGA Part—2097-A1
Actual size—3¼" Dia.

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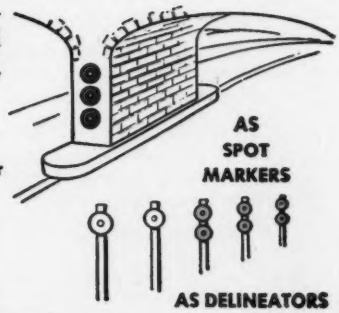

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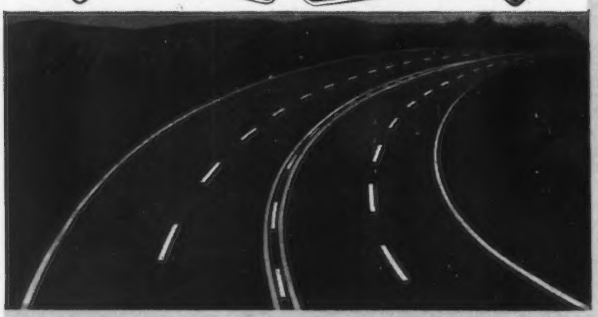

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TRAFFIC ENGINEERING

OFFICIAL PUBLICATION OF THE INSTITUTE OF TRAFFIC ENGINEERS

Vol. 30 AUGUST, 1960 No. 11

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Cover: Chicago's Wells Street Plaza, easterly terminus of Congress Expressway, carries 100,000 vehicles per day. Ramps at lower left connect with bi-level Wacker Drive which borders on the west and north edges of the central business district. Photo furnished by City of Chicago, Bureau of Engineering.

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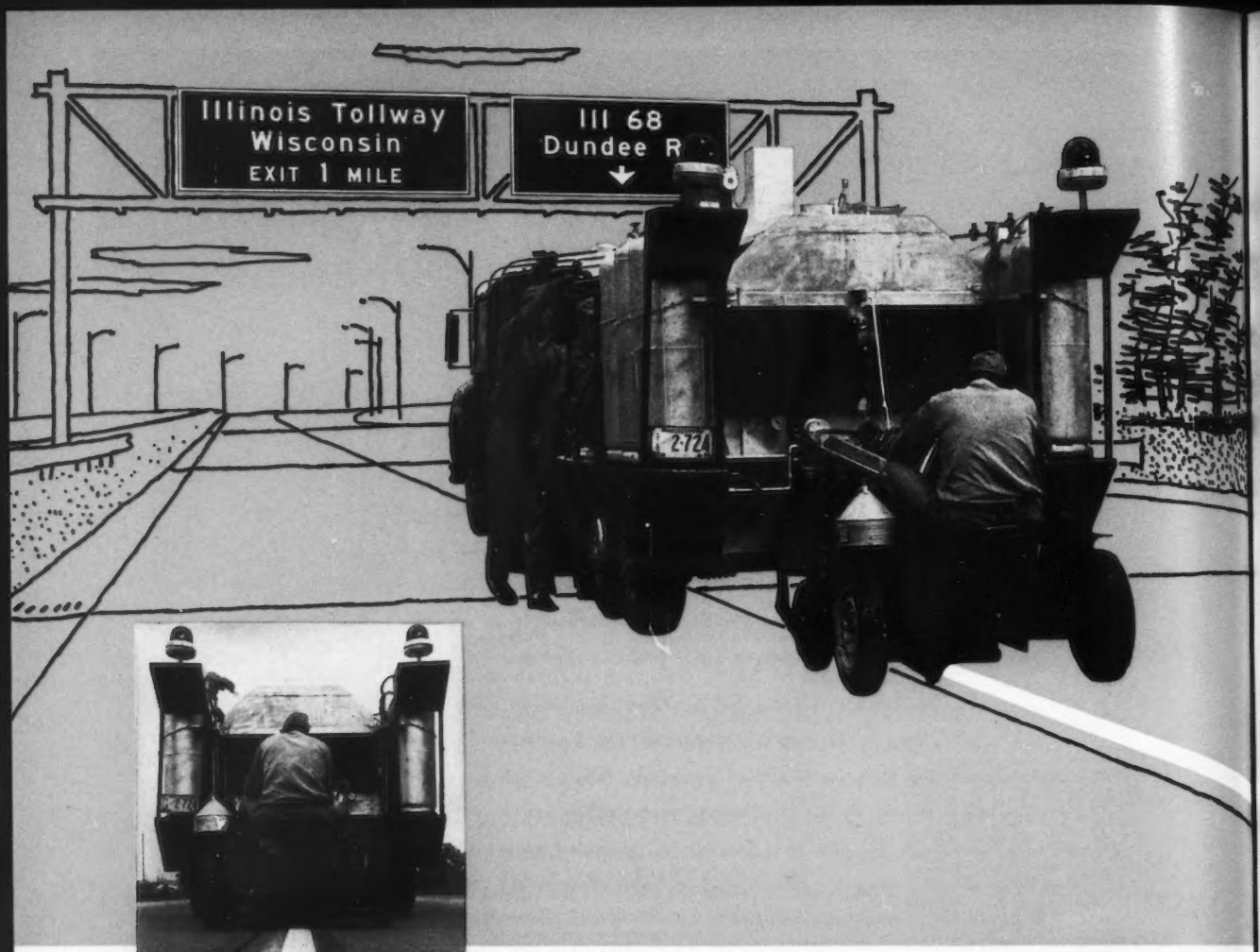
Frankly Speaking . . .

PERHAPS ONE OF THE most outstanding examples of the rapid rise and substantial development of a new technical profession is that of traffic engineering. Within little more than three decades, rising in response to a need that scarcely existed, and went largely unrecognized until vehicles accumulated in sufficient numbers on the streets and roads of the early 1920's, traffic engineering is providing the basis for making a transportation system out of a highway system.

The body of information that has been accumulated, correlated and rationalized in so short a time concerning the operational characteristics of highway networks and their operating elements is almost incredible. While much working information was naturally obtained on the job through observations and surveys, a series of notable researches over the past two decades has provided knowledge of very substantial character concerning the functioning of highway networks. Studies of the capacities of roadways, of the characteristics of moving streams of traffic, and of traffic demands on highways, have not only laid a firm basis for improving operational efficiency and safety and for establishing workable controls to movement, but have fed back into the design process and, in a sense, have revolutionized the planning and design of highway facilities.

A significant development, of relative currency, is the attention being given to the formulation of adequate theory of traffic flow. This kind of problem has interested research workers in other scientific disciplines, such as physics, mathematics and statistics. A strengthened scientific base for knowledge of flow phenomena seems to be in the making.

HARMER E. DAVIS, *in Chairman's Address to 39th Annual Meeting of the Highway Research Board*



Cataphote crew lays long-lasting Catatherm on Eden's Expressway—Chicago.

Cleanly extruded Catatherm hits and bonds to pavement at approximately 400° F. Stripe is traffic-ready 3 to 6 minutes later.

Catatherm Reflective Thermoplastic Striping goes down easy . . . stays down longer

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Pace setters in traffic control have recognized the advantages of Catatherm. Now, they "STRIPE IT . . . AND FORGET IT." Like to be a leader, too? Let us tell you more about Catatherm. Write for Catalog C-160.

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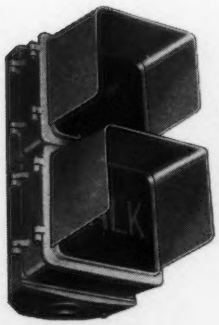
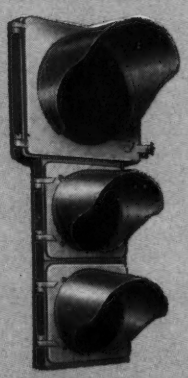
Engineering and construction features of top quality materials built into *every* EAGLE TRAFFIC SIGNAL is your assurance of years and years of continuous high performance. Present and future citizenry and officials will never criticize your choice when you select EAGLE traffic control equipment.



Model KB312
Pedestrian Signal

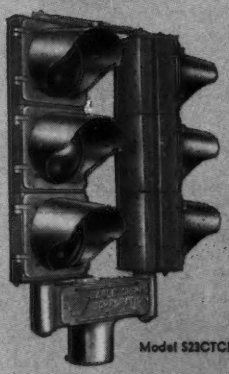
PEDESTRIAN SIGNALS
An Eagle exclusive. Distinctive square shape, prismatic lens with 3" high letters in each section that imparts a clear separate message. Illuminated by standard traffic signal lamp — NO TRANSFORMER REQUIRED. Mounts on standard signal brackets.



Model KB293, 12" red, 8" green and amber

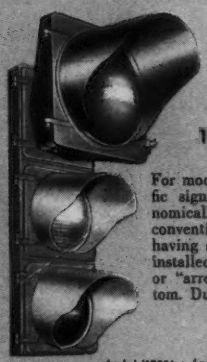
Model KB382, 12" lenses

12" SIGNALS
For extra long range visibility in rural and high speed highways, Eagle's extra large lenses, a full 12" in diameter, provide greater visibility for motorists. Red, Amber and Green lenses are available in either "Wide-Angle" or "Narrow-Beam" type.



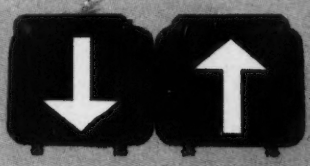
Model 523CTCH

TWO AND THREE-WAY TERMINAL COMPARTMENT SIGNALS
These signals are designed for slip fitter mounting at top of standard 4½" O.D. pedestals. Wide opening and large terminal block provides maximum accessibility and wiring ease.



Model KB331 (patent applied for)

12" SIGNAL ADAPTER
For modernizing existing traffic signals quickly and economically. Adaptable to all conventional 8" signal heads having square doors. May be installed as a 12" red at top or "arrow" indication at bottom. Dustproof — waterproof.



Model KB579 — 12" Square Signal

LANE SIGNALS
For use where the direction of travel in center lanes is changed at various times of the day. These signal indications are designed to be different and distinctive from regular signal indications. Illuminated backgrounds are red and green with opaque black indications. Can also be used as a pedestrian signal with large 4½" letters.

Write for Eagle's complete descriptive Traffic Bulletin A10. Address Dept. TE-860

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835 NO. WOOD STREET • CHICAGO 22, ILLINOIS

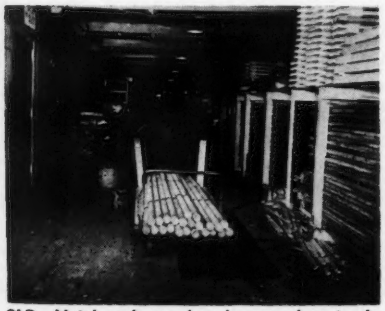
Chicago's Automated Sign Shop

By Don R. Crowell
Associate City Traffic Engineer
City of Chicago, Bureau of Street Traffic

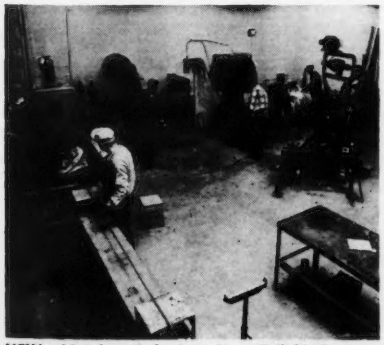
CHICAGO'S SIGN DIVISION can finally and definitely state that it will take no "back seat" in providing the city traffic engineer with the most modern and efficient tool to implement his plans and work orders into immediate fact. That such a statement could be made was the result of years of planning and pleading on the part of the city administration.

For years city fathers, watching the role of the traffic engineer expand and his responsibilities multiply, asked for financial aid through popular referendum to build a new sign shop. However, the public, apathetic to the needs, repeatedly disapproved bond issues to pay for a new shop.

It was jokingly said that even horses who were stabled nearby had better facilities than the Chicago Sign Division. The division had been housed in a dilapidated wooden structure, 300 feet long and 30 feet wide, sandwiched between two railroad embankments.



OLD—Metal work was done in area where trucks were stored at night.



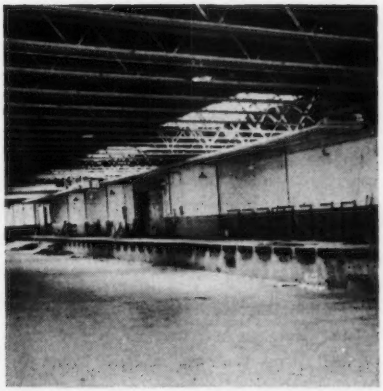
NEW—Metal work is done in well-lighted roomy area.

Although condemned by the fire department, the shop housed 150 Sign Division personnel. Spray painting was done in a makeshift booth near a gasoline pump. Drop hammer operators worked in the gloomy light of 60 watt lamps. Yet under these circumstances some 25,000 signs were produced each year. Purchases of signs from outside sources made up the difference between production and demand.

Inasmuch as there was no space to garage trucks, about 50 per cent of the usable floor area served a dual purpose—garage by night and working space by day. Under this arrangement shop artisans could not begin to work in the area until trucks were loaded and dispatched. Likewise, work would cease when trucks began to return from the field. With the departure of trucks, carpenters, blacksmiths, sheet metal workers and sign painters would roll out their equipment from nooks and corners to begin the day's production. As a consequence, there was almost always a 6-month backlog of sign and paint work orders.

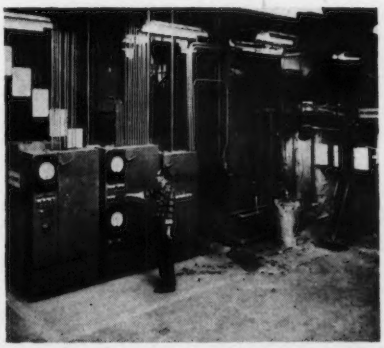
In 1955, the city administration again submitted the proposal to finance a new sign shop to referendum. With aid from newspapers and civic groups, the proposal carried by an overwhelming vote.

Financed out of a $750,000 bond issue, a modern plant of 56,000 square foot floor area was completed in the latter part of 1958. As a part of the project two subdepots were acquired, one located on the north side of this city and the other on the south side. Savings in travel time more than com-

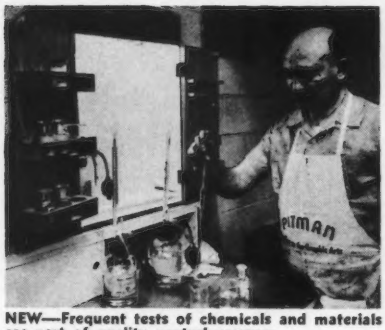


NEW—Completely enclosed, the truck loading dock is 300 feet long.

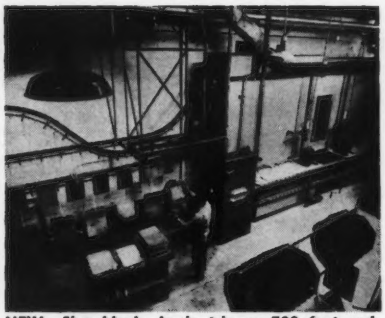
OLD—Sign blanks were sprayed by hand and air dried in racks.



NEW—Sign blanks are sprayed automatically by gun traveling so fast it appears as a blur. Control panel in foreground supervises entire sign finish cycle.



NEW—Frequent tests of chemicals and materials are part of quality control program.



NEW—Sign blanks begin trip on 700 foot endless conveyor chain. First step is degreasing and cleaning.

NEW—Finished signs are stored in rolling racks which are pushed into gas fired oven for drying.

pensate for added overhead costs of maintaining the subdepots.

The main plant which is centrally located contains a completely automated sign production system and various shops—carpentry, blacksmith, sheet metal and pipe. There is ample storage space for paint and metals used in sign production. Trucks are loaded at a dock which is 300 feet long and completely enclosed.

The sign production system has been cited by the paint industry as being one of the most efficient systems in the country. Designed as an automated, push-button system, it can turn out 250,000 quality signs per year at one-fourth the cost under the old system.

Fed by a 700 foot endless-chain conveyor, sign blanks are sped at 12 feet per minute through five stages of metal treatment, baking ovens, primer dipping, and reciprocating enamel spray machines, and are delivered as a finished product in 40 minutes. Stripping of used sign blanks is also automated. Continuous supervision of chemicals and materials plus good housekeeping insure control of quality signs with life expectancy of ten years. With the promise of longer life, it is expected that the annual work load of installing and replacing 75,000 signs will taper off.

In addition to modern sign production and metal working facilities, a giant step was taken in speeding the production of silk screens used for applying legends and symbols to sign blanks. A photographic method which can reproduce the most intricate designs and patterns was adopted.

In addition to personnel required to operate the shop, the Sign Division has in the field 16 pavement marking crews, 16 sign crews, one sign cleaning crew, and one heavy construction crew. Pavement markings are laid by three self-propelled heavy-duty spray machines and a dozen hand-propelled gravity machines. Approximately 70,000 gallons of paint are used annually in marking 4,000 miles of center and lane lines, 7,000 crosswalks, and 33,000 parking spaces.

OLD—Stripping of paint from used signs was a time-consuming, messy job. Paint removal and refurbishing process in new plant produces as much in one day as old method did in one year.

NEW—Silk screens are produced by photographic process requiring fraction of time used in hand cut method.

For Flashing Signals and Beacons

Specify The Flashers With Performance Proven Dependability

engineering and design features that have made Time-O-Matic the leading manufacturer of flashers since 1932

- open frame construction for efficient heat dissipation
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- not affected by extreme temperature variations
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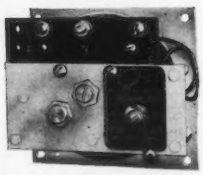
Model 46
1 or 2 circuit, front-mounted cams and contacts out in the open for fast, easy adjustment, replacement. Compact size 4⅜" high, 4" wide, 2¼" deep



Model 3
1 or 2 circuits

Model 37 Jack-mounted
Available with or without meter base and cover, as shown, 1 or 2 circuits

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Traffic Islands
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Simulation - - -

Its Application to Traffic Engineering

Part I

By Martin Wohl

Assistant Professor of Transportation Engineering
Massachusetts Institute of Technology

Simulation has experienced widespread application in various fields of science and engineering. Until recent years, however, traffic engineering applications were limited to simulation which utilized physical models. With the rapid development of electronic digital computers it has now become feasible to consider simulation of vehicular traffic flow by mathematical or symbolic models. This type of simulation has tremendous potential for solving the everyday analysis and design problems facing highway and traffic engineers.

The first part of this paper will seek to define simulation, the major steps in the simulation process, and its applications to the field of traffic engineering. The second part will illustrate the simulation process by following through a simulation program which deals with a specific, though simplified, design problem.

SIMULATION, according to the dictionary, is "to assume the appearance of without the reality." In a technical sense, simulation might be more adequately defined as the *imitation of a real situation by some form of model.* The engineer will recognize that simulation has often played an important role in his work. In fact, this tool has been common in transportation engineering for many years. It was first utilized with model planes, boats, and railroad trains. More sophisticated and later engineering applications included model basins, Link trainers, and wind tunnels.

The examples above emphasize uses and advantages of simulation, but they all utilize only one type of model—that is, a physical model. Within the last decade, though, more attention has been given to simulation which makes use of analogue and symbolic or mathematical models and has broadened the body of knowledge in theory of traffic flow. This traffic flow theory and the rapid improvement of the electronic digital computer have mutually been responsible for the development of simulation as a design tool in traffic engineering.

The purpose of a simulation experiment is to represent or "model" the actions and interactions of the elements of a system such that the effectiveness or level of service of the system (in terms of capacity, backup, etc.) can be determined for any set of design conditions. Simulation, therefore, enables us as engineers to "predict" operation on a facility prior to its construction and thus permits us to select these design components which will provide for the most efficient flow.

In general, simulation experiments depend on the work of both scientists and engineers. Scientists determine how the elements of traffic flow are interrelated, and engineers apply this knowledge to specific design tasks. It is the work of the latter group, of course, with which we are most concerned. The balance of this paper will, therefore, deal with the applications of simulation by the design engineer rather than with the efforts of the scientist. We will define in some detail the process which the engineer follows in simulating a design situation. We will discuss its components, the different types of models to be used in simulation experiments, as well as techniques of solution. Finally, we will present a simple design problem which can well be handled by a simulation experiment.

THE SIMULATION PROCESS

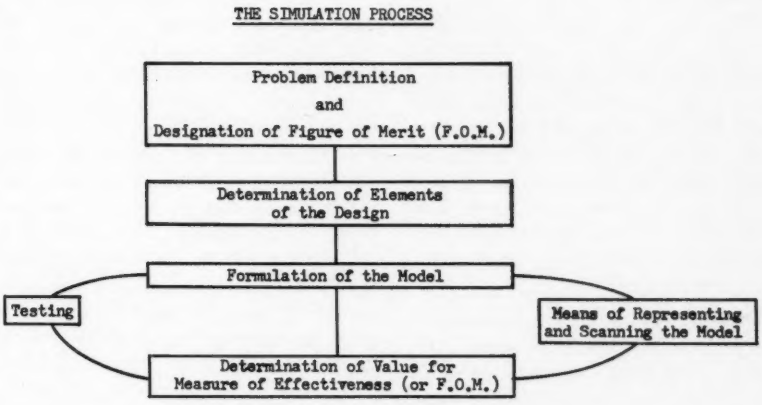

Figure 1

Introduction

The simulation process may be illustrated in block diagram form as shown in Figure 1. Each of the steps shown is not independent of the ones before or those following. Nevertheless, it will be helpful to discuss the process as though it were a series of definite steps. Also, in following the process, it will be helpful to remember that in

Another in the "computor series" coordinated by Daniel L. Gerlough. Part II will follow in an early issue.—Ed.

simulating a real situation we are not particularly interested in the "realism" of the model that will express the actions and interactions of all the elements of the system, but in knowing the effects of various design conditions on the flow in a particular design situation. Thus, we are only interested in including those design elements which will affect the level of service afforded by the design and not necessarily in including all of the variables concerned.

Problem Definition and Designation of Figures of Merit

The engineer is often motivated to consider improvement of an existing highway facility or the construction of a new highway facility on the basis of rather ill-defined "yardsticks," such as congestion, backup, low capacity, accident rates, etc. For all practical purposes the engineer uses these same vague criteria as the measures of effectiveness by which future design solutions will be judged.

The designation of these measures of effectiveness, or "figures of merit" (F.O.M.), is extremely important, and an item which is often given only scant attention by the traffic engineer. Whereas the traffic engineer may have the general objective of reducing congestion or delay or backup, he must have some explicit and definitive yardstick by which he can measure whether or not he has achieved the objective that he originally set. To say that congestion is reduced is not enough; the F.O.M. must allow the engineer to express *how much* it is reduced as well.

In actually designating the F.O.M. for a given design project, the engineer must take into account three important aspects: 1) The F.O.M. that he selects must measure the effectiveness of the entire design with which he is dealing (i. e. to "optimize" *each part of a system separately* is *not necessarily* to "optimize" the system as a whole); 2) It must be possible to state the F.O.M. in quantitative terms (even when only crude values are obtainable); if this condition is not met, the design can only be selected using implicit values which may or may not bear any resemblance to reasonable values; 3) The F.O.M. should be confined to those quantities which can be sampled (for testing purposes) with reasonable speed and accuracy; this implies that the events in question occur with relatively high frequency and regularity.

Common measures of effectiveness (or F.O.M.'s) for traffic situations might be: 1) Maximum flow; 2) Average delay per vehicle; 3) Average delay per mile of travel; 4) Average time the vehicles are in the system; 5) Per cent of vehicles traveling less than design speed; 6) Number of lane changes per mile of travel; 7) Number of vehicles stopping per unit time; 8) Maximum backup; 9) Accident rate; and so forth.

The traffic engineer will generally be interested in considering more than one F.O.M. (such as delay *and* backup); frequently these multiple F.O.M.'s may reflect conflicting objectives. However, in order to select the best design, multiple F.O.M.'s must ultimately be expressed in commensurate terms (such as dollars) in order to maximize, let us say, the return on our investment or minimize cost for the entire design.

Determination of Elements of the Design

In typical design problems facing the traffic engineer there are many variables or elements involved. These elements or variables fall into two classes: 1) Controlled variables; and 2) Uncontrolled variables. The former group of variables includes those elements of design (such as number of lanes, the sight distance, length of acceleration lane) which can be varied by the engineer. The uncontrolled variables represent elements over which the engineer has no control. These include such things as reaction time or braking power of vehicles. It should be clear that at least one of the variables or elements of the design must be controllable. Otherwise an "optimum" design can occur only by chance and the engineer's talents would be of little use.

Formulation of the Model

Again, a model represents or expresses the actions and interactions of the elements of the design in such a way that the effectiveness of the system can be measured for those conditions the engineer imposes. If, for example, the engineer is attempting to minimize delay at an intersection, then he must formulate a model expressing the relationship between number of approach lanes, length of cycle, phase split, etc., such that the delay can be measured for any combination of these elements.

There are three basic types of models: 1) Physical; 2) Analogue; 3) Symbolic (or mathematical or logical).

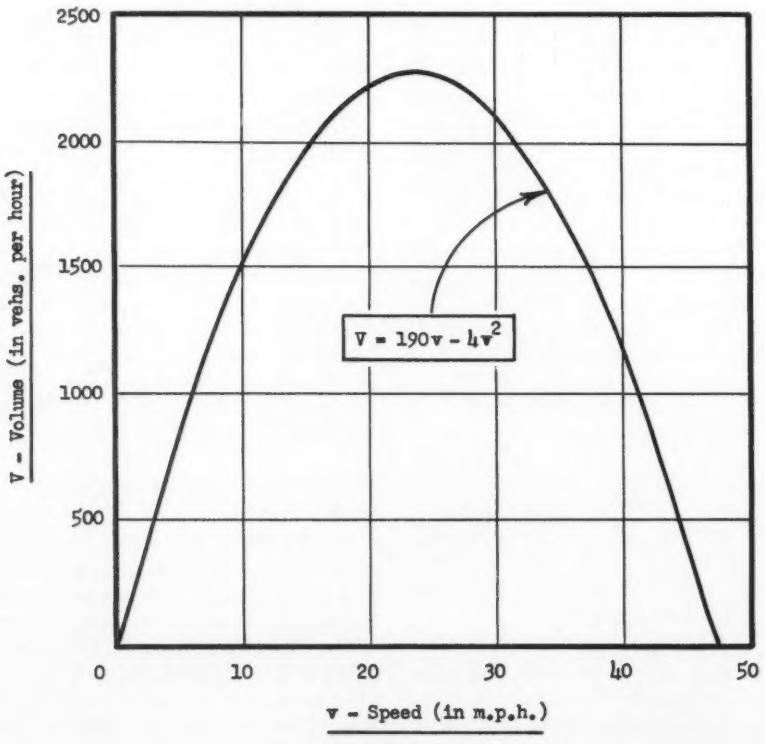

Figure 2

As pointed out earlier, physical models are familiar to the traffic engineer as well as to the aeronautical engineer, the naval engineer, the architect, etc. Obviously this type of model has its major advantage in the visual image it creates. On the other hand, it has many disadvantages. It is often costly and time-consuming to build, and it is sometimes impossible (within the limits of time, expense and present state of technology) to build a suitable model (such as one that would represent the movement of peoples and goods within a metropolitan community, for example). More important, this type of model is not readily adaptable for studying the effects of design changes and evaluating the consequent F.O.M.'s.

Analogue models have elements which function in a manner similar to those of some other system, but where the elements of the systems being compared are dissimilar in appearance and structure. While this type of model has been useful in certain traffic flow studies, further applications will be limited for reasons similar to those outlined for physical models.

The third type of model—be it called a symbolic model, a mathematical model, a logical model, or a symbolic-logical model—is already more common than may be realized. It uses symbols to represent the variables or elements of the system and in turn relates and interrelates the elements in mathematical or logical terms. A mathematical equation and a flow chart are two examples of symbolic models. Let us emphasize, however, that the elements must be interrelated such that the F.O.M. value can be determined for any set of variables imposed by the engineer.

In its simplest form the symbolic model can be stated as follows:

$$E = f(x_i, y_i)$$

where E = Meaure of effectiveness (or F.O.M.)
x_i = Uncontrolled variables
y_i = Controlled variables

Symbolic models may be separated into two rather general classes, though simulation experiments will often include both classes of models:

1) Rigid models.
2) Probability models.

In the former case, variables are related in precise mathematical terms and are given exact or averaged values. On the other hand, when it is necessary to consider the statistical nature of the variables (such as the distribution of speeds on a highway rather than the average speed), the resulting model is classed as a probability model, and the distribution of values would be represented by a probability density function (Figure 3 is an example).

Determination of Measure of Effectiveness (or F.O.M.) Value

Following the formulation of the model in which the measure of effectiveness is expressed as a function of the variables of the system, the F.O.M. value must be determined for a particular set of design variables (or the variables must be determined for the conditions under which the F.O.M. value will be maximized).

Clearly, the manner in which a solution will be derived from a particular model will depend to a great extent upon the nature of the model (i. e., rigid or probability model, etc.). Also, the type of solution required will depend on the restrictions which are placed on the engineer by the time available for solution, by the accuracy necessary, by the state of data-processing technology, and by the costs associated with alternative solution techniques.

The model may be solved—that is, an F.O.M. value determined—by utilizing one or more of three general solution techniques. These are: 1) Analytical techniques; 2) Numerical techniques; and 3) Monte Carlo techniques.

An analytical technique deduces an abstract solution by the utilization of mathematical tools such as algebra and calculus. The measure of effectiveness may or may not be determined directly since the objective may be to determine the conditions under which the F.O.M. is a maximum rather than the value of the F.O.M. itself. To illustrate the use of an analytical technique, the following example is included:

Example 1—Empirical studies have indicated the possible existence of a general relationship between speed and volume which might be characterized or expressed by the following rigid mathematical model:[1]

$$V = 190\,v - 4v^2$$

where V = Hourly volume (in

1 Data extracted from Figure V.1, *Statistics with Applications to Highway Traffic Analyses*, B. D. Greenshields and F. M. Weida, The Eno Foundation for Highway Traffic Control, Saugatuck, Conn., 1952.

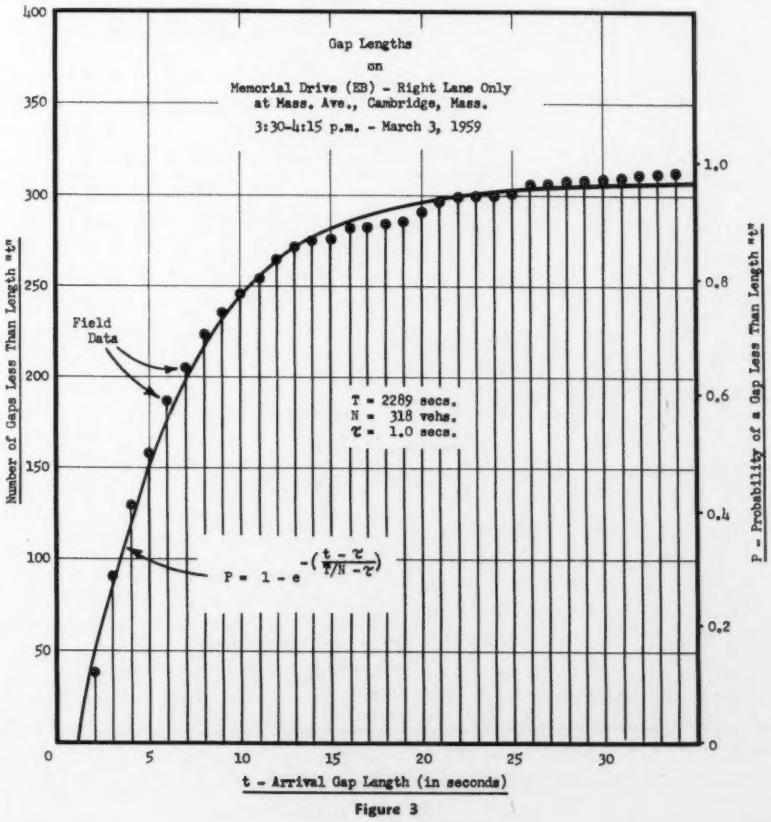

Figure 3

vehs. per hour)
v = Speed (in m.p.h.)

Problem: Determine the speed at which the hourly volume is a maximum (i. e., volume is defined as the measure of effectiveness or F.O.M.).

Solution: The maximum volume occurs at the point where the slope of the function $V = f(v)$ is zero; that is,

when $\frac{dV}{dv} = 0$. (See Figure 2.)

$\therefore \frac{dV}{dv} = 190 - 8v; \; 190 - 8v = 0$

and $v = \frac{190}{8}$ or about 24 m.p.h.

when V = Maximum.

In the preceding example the objective was to maximize the volume of traffic flow on a given facility. Volume was expressed as a function of only one variable, that of speed, and the analytical solution determined the speed at which the volume is a maximum. In this case it was not necessary to know the maximum volume, but only to know the speed at which it occurred. For rigid models such as this one, an analytical solution is often ideal and may not require a high order of mathematical competence. On the other hand, models can rarely be formulated in such simple terms, much less solved by utilizing such straightforward mathematics. As a consequence, it may be more convenient to obtain a solution by some other technique.

Numerical techniques generally employ "trial-and-error" processes, where various values of the controlled variables are substituted, the results (or F.O.M. values) obtained and then compared for determination of the conditions under which the effectiveness is maximized. Under certain circumstances this procedure will prove to be prohibitively expensive and time-consuming, particularly if all possible values and combinations of the controlled variables are considered. As a consequence, it may be necessary to develop iterative "trial-and-error" procedures; these allow convergence upon the most effective solution with a smaller number of trials.

It is possible to "solve" the earlier example (that is, determine the speed at which the volume is a maximum value) using a numerical or "trial-and-error" procedure. In this case, it would be necessary to determine the volume V for *all* possible values of speed v, and then to select the speed corresponding to the highest volume. Obviously, the process is tedious, and obtains an exact solution only if *all* possible values are substituted (except by "chance"). Also, it is evident that for this particular problem, the analytical solution procedure is to be preferred.

Space does not permit additional discussion of numerical solution procedures. However, the Fratar Method for the determination of vehicular trip distribution by successive approximations serves as an excellent example of another such technique.[2]

Solution techniques for probability models must usually be somewhat more rigorous than those for rigid mathematical models. Once it becomes necessary to represent a variable by a range of values—or distribution of values—the problem not only becomes more tedious and complex, but it often requires entirely different solution techniques. In general probability models are more difficult to formulate and are much more difficult to solve by analytical rather than numerical procedures.

As the traffic engineer well knows, he can seldom accurately represent the elements or variables of highway design by a single value. For example, he knows that vehicle speeds on freeways may vary from 20 to 80 m.p.h. He knows that starting reaction delays at an intersection may vary from one to seven seconds. He knows that the time spacing between vehicles is hardly uniform. Unfortunately, virtually every element with which he deals must be represented by a distribution of values if the results are to be realistic.

The Monte Carlo solution technique is particularly useful when probability models are required—that is, when it is necessary to account for the range of values. It is not a technique which determines a solution in the same sense as the examples above but one which plays a role in this process. Briefly, it applies random sampling in finding the probability of an event or of joint events, and thus provides the situation being simulated with realism by allowing probabilistic events to occur with the same randomness as that taking place in nature. Each time another

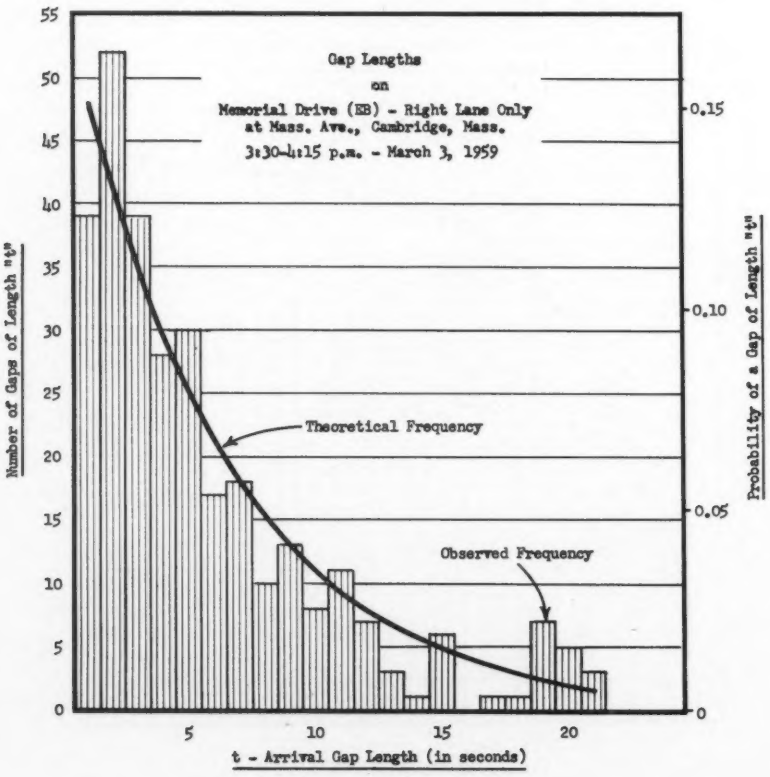

Figure 4

2 See: *Highway Traffic Estimation*, R. E. Schmidt and M. E. Campbell, The Eno Foundation for Highway Traffic Control, Saugatuck, Conn., 1956, pp. 199-207.

sampling is made (to represent one or more probabilistic occurrences) another experiment or trial results. The accuracy of the evaluation will depend upon the number of trials and upon the statistical nature of the probabilistic event being sampled.

To illustrate the Monte Carlo technique the following example is included which utilizes the technique in order to determine arrival gaps or headways between successive vehicle arrivals at some point in a highway:

Example of the Monte Carlo Technique: Arrival gaps (or time spacings) between successive vehicles were observed on a local roadway for approximately 45 minutes. During this time there were 318 vehicle arrivals (and arrival gaps). Figure 3 shows the actual frequency distribution of the arrival gap lengths, and Figure 4 shows the cumulative distribution of these gap lengths.

The continuous curves on Figures 3 and 4 illustrate but one attempt to represent the gap distribution by a mathematical model. In this case an exponential distribution was used to express the distribution of the actual field data.

Some of the observed and theoretical data of Figures 3 and 4 are included in Table 1. It is apparent that the observed and theoretical distributions are in close agreement, and the possibility exists for using either observed or theoretical data. For the balance of this example, it will be assumed the theoretical distribution is adequate and therefore can be used for all calculations.[3]

If a random fraction between 0.0 and 1.0 is "generated"[4] (or selected from a random number table) it will have an equal chance of falling anywhere within the range of probabilities in column (e) of Table 1; on the other hand, this random fraction obviously will fall more frequently within those gap length ranges of large frequency than within those of small frequency.

Once a random fraction is "generated" we may determine random arrival gaps—that is, compute these gaps in the same order as they occur in the field—by comparing the fraction to the probabilities of column (e) and determining the corresponding gap length. For example, if the random fraction was 0.298, which falls between the probabilities for 3.0- and 4.0-second gap lengths, the corresponding gap length would then be 3 seconds. A second random fraction would then be generated and the gap length determined, and so forth, until the desired number of arrival gaps had been "generated" or computed.

Table 1

(a) Arrival Gap Length (in seconds) "t"	(b) Observed Number of Gaps Equal to "t"	(c) Theoretical Number of Gaps Equal to "t"	(d) Observed Probability of a Gap Less than "t"	(e)* Theoretical Probability of a Gap Less than "t"
0	0	0	0.0	0.0
1	39	47	0.0	0.0
2	52	41	0.123	0.149
3	39	34	0.286	0.276
4	28	29	0.408	0.384
5	30	25	0.496	0.476
6	17	21	0.590	0.554
7	18	18	0.644	0.620
8	10	15	0.700	0.676
'	'	'	'	'
'	'	'	'	'
'	'	'	'	'
∞	0	0	1.000	1.000

NOTE: For this example, we will assume only integer gap lengths occur. Also, columns (d) and (e) are cumulative probability distributions.

*Determined by using the following expression:

$$P = \text{Prob. of a Gap less than "t"} = 1 - e^{-\left(\frac{t-\tau}{T/N-\tau}\right)} = 1 - e^{-\left(\frac{t-1.0}{2289/318-1.0}\right)}$$

Where N = Vehicular flow during time interval T = 318 vehs.
T = Duration of flow N (in seconds) = 2289 seconds.
τ = Minimum arrival gap or time spacing (in seconds) = 1.0 second.
t = Arrival gap length.

The example above illustrates the use of the Monte Carlo solution technique, though it points out only one alternative method of utilizing this tool. In this particular example, the arrival gaps were determined by a 4-step process:

1) Calculating and tabulating the cumulative probabilities.

2) Storing this information in the computer "memory."

3) "Generating" random fractions.

4) Determining arrival gap length by table look-up operation.

This process would have two major disadvantages. First, memory space would be required for storage of the cumulative probabilities and their corresponding gap lengths. Secondly, the comparison or table look-up operation is time-consuming and thus expensive (with regard to computer efficiency.

As a consequence, a more desirable alternative would be to utilize the mathematical expression or exponential function (see bottom of Table 1) directly, rather than using the tabulated values which were obtained from this function in the first place.

The earlier equation expresses the probability as a function of the gap length, volume of flow, duration of flow and minimum time spacing. The last three variables are constants for this case; therefore, the expression can be manipulated or reversed to express the gap length as a function of the probability as follows:[5]

$$t = \tau - (T/V - \tau) \log (1 - P)$$

If a random fraction is "generated" and substituted for (1 — P), the arrival gap length "t" can be computed directly using the equation above. This can be repeated, determining the desired number of arrival gaps.

The Monte Carlo technique is applicable to any part of a simulation experiment which involves random events or probabilities. Though the discussion thus far has been limited to the case of arrival gaps, it must be recognized that this is only an isolated example of the general application of "unrestricted random sampling."

General Remarks About the Simulation Process

Our attention has only been directed at four of the major steps of the simulation process:

1) Problem Definition and Designation of Figure(s) of Merit.

2) Determination of Elements of the Design.

3) Formulation of the Model.

4) Determination of Measure of Effectiveness (or F.O.M.) Value.

We have neglected to describe the means of representing and scanning the model, a step indicated in the block diagram of Figure 1. Briefly, it is nec-

(Continued on page 29)

3 The Chi Square between observed and theoretical frequencies indicates a goodness of fit at the 0.10 acceptance level.

4 See: Gerlough, D. L., "Traffic Inputs for Simulation on a Digital Computer." Highway Research Board Proceedings, 1959, pp. 480 ff.

5 Ibid.

Uniform Traffic Control Devices for Canada

By W. Q. Macnee
Traffic Engineer
Ontario Department of Highways

FOR MANY YEARS the Manual on Uniform Traffic Control Devices for Streets and Highways, as published by the U. S. Bureau of Public Roads, has been used as a guide for Control Devices in Canada. For similar reasons to those found in the United States, however, uniformity was not attained. Further difficulties were encountered in Canada, particularly with respect to signs, because of the extent of bilingualism. Large segments of Canada are French-speaking while the rest of the country is basically English-speaking. Following World War II, the large number of immigrants entering the country aggravated the already critical signing problem of multilingualism.

These factors created the demand for the establishment of a set of standards that would be accepted on a nation-wide basis. Canadian nationalism further insisted upon a development of standards from, if you will pardon the expression, first principles. Furthermore many of the AASHO standards were felt to be well behind current requirements.

In the interest of developing a set of Canadian Standards and, more importantly, for ensuring that such standards would be acceptable nationally, the Canadian Good Roads Association and the Institute of Traffic Engineers (Canadian Section) joined forces and created the Joint Committee for Uniform Traffic Control Devices for Canada.

The composition of this committee was the first major problem to be faced. In the first place members were needed who could recognize acceptable standards—we were not looking for rubber stamps. In the second place we wanted these same members to be in such a position that their approval of a standard would, in effect, commit a portion, at least, of Canada to also adopt the standard. With these criteria in mind representatives were requested from each of the 10 provinces, from 11 of the largest municipalities, from 2 federal government departments and from 4 national associations. The omens of good fortune immediately began to appear as each of the above agreed to be represented and, furthermore, the representatives themselves proved to be of the highest calibre. From the start it became apparent that if a manual could be produced it would almost automatically be accepted on a completely national scale.

Then came the selection of the necessary sub-committees and their composition. Sub-committees were formed for Signs, Signals, Pavement Markings, Islands, Research, Editing and French Language Editing. Each sub-committee was required to have, as a minimum, two representatives from each of the five geographic regions of Canada (one urban and one rural). However, there was no limit as to the ultimate size of each sub-committee. The signs sub-committee actually wound up with a full-time membership of 30.

The first report came in from the Islands sub-committee and was rather brief. It was to the effect that the subject of Islands belonged to a Manual of Geometric Design Standards rather than to a control devices Manual. Since it has been the intention of the Canadian Good Roads Association to have a Canadian Manual on Geometric Design prepared, the decision was therefore made to refer this matter to the new committee and to delete it from the Control Devices Manual.

The next sub-committee to fulfill its obligation was Pavement Markings. Within this chapter are some items that are somewhat at variance with the "Yellow Manual." In the first place, the former terminology of "Centre Line" was dropped in favour of "Directional Dividing Line." This was held to be necessary as quite often this line was found to be located at an off-centre position so as to obtain the most efficient use of the roadway. Rather than confuse the issue with a series of names and definitions it was decided to limit our terminology to "solid barrier line" and "broken line." The various combinations of these two lines speak for themselves and thus do not need special definition. A new innovation is the double broken line. This is to be used on four-lane streets that operate part time as two-lane streets because of parking during off-peak hours.

With respect to colour the Canadian Manual states "All pavement markings shall be white except for pavement edge lines, streetcar clearance lines and transit vehicle guide lines and curb markings for parking restrictions, which shall be yellow."

Most provinces have already adopted the new pavement marking standards as have most of the larger municipalities.

The next sub-committee to report was the Signals Committee. This chapter of the Manual resulted in a great departure from the "Yellow Manual." In the first place, no description is provided of equipment. It was felt that so many changes and advancements are occurring in this field that such descriptive material would be out of date very shortly after printing.

A specific location has been recommended for signal heads. This was one item where uniformity was felt to be more important than the precise location. The use of the 12″ red lens is recommended for use on the primary head location.

The most fundamental change in the signals chapter lies in the use of Delay

Warrants. The following is a reprint of the section dealing with Installation Warrants, in the Canadian Manual.

B 2.02 INSTALLATION WARRANTS FOR TRAFFIC CONTROL SIGNALS

The installation of traffic control signals at any location will be justified and will probably prove beneficial when any one of the following warrants, vehicular, pedestrian or accident, is completely satisfied.

B 2.02.01 Vehicular Warrants

The installation of traffic control signals will be warranted when every one of the following conditions is satisfied:

a) The existing delay to cross-street traffic exceeds that which would be occasioned by the operation of properly timed signals;

b) The volume of cross-street traffic is at least 60 vehicles per hour in any one direction;

c) The conditions specified in (a) and (b) exist for any four (not necessarily continuous) hours of a normal day;

d) The intersection is, or can be made, suitable for signalization.

For the purpose of this warrant, intersectional delay should be expressed as the percentage of the cross-street vehicles in the heavy direction which are forced to stop for more than a momentary safety interval. The figure representing the existing delay should always be determined by a study conducted at the location in question.

Delay due to signal operation can be determined from Table 3 (B 2.03). The suitability of the intersection for signalization can be determined from the condition diagram, special note being taken of any physical feature, such as grades and restricted visibility or complexity, which might render the installation inefficient or even dangerous. In all cases where the use of more than two phases would appear necessary, an attempt should be made to simplify the intersection either by channelization or by turn prohibitions and/or the creation of one-way streets.

B 2.02.02 Pedestrian Warrants

The installation of traffic control signals, whether at an intersection or at a mid-block location, will be warranted when every one of the following conditions is satisfied:

a) Pedestrians on an average must wait in excess of 60 seconds before being able to cross the main street in safety;

b) The number of pedestrians wishing to cross is at least 60 per hour;

c) The conditions specified in (a) and (b) exist for any four not necessarily continuous hours of a normal day;

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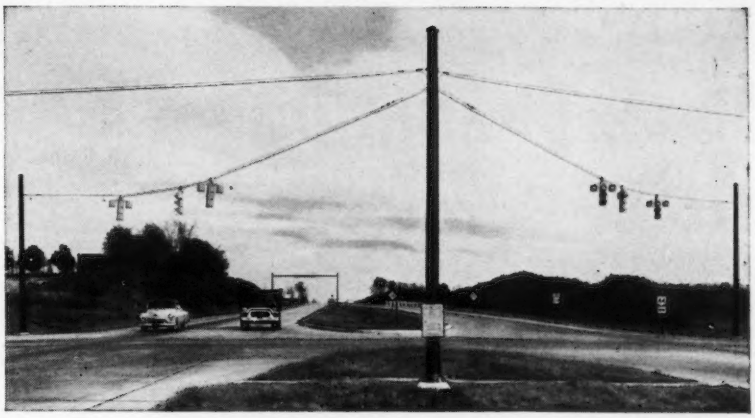
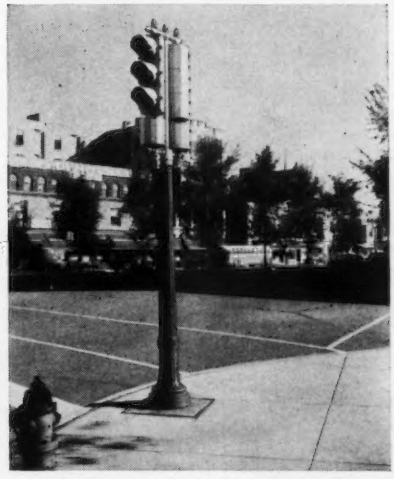


SUSPENSION TYPE

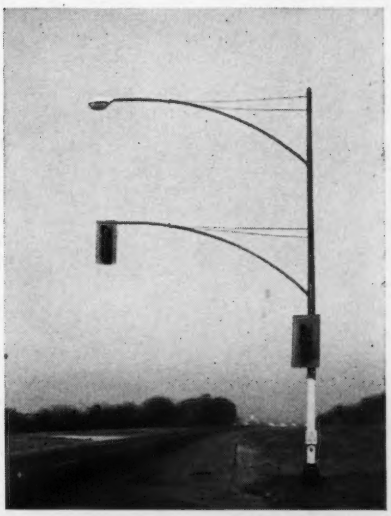
Your signal to savings . . .

UNION METAL TRAFFIC SIGNAL POLES

Steel or Aluminum



PEDESTAL TYPE



MAST ARM TYPE

UNION METAL

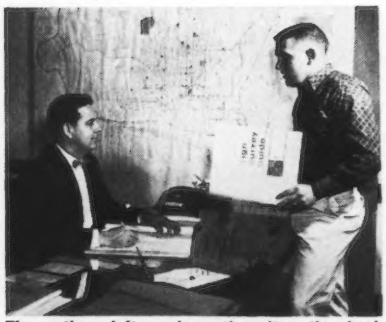
Traffic Signal Poles

THE UNION METAL MANUFACTURING COMPANY

CANTON 5, OHIO BRAMPTON, ONTARIO, CANADA

Sioux City Upgrades Traffic Control

By Norman C. Barnett
Traffic Engineer, Sioux City, Iowa



The author, left, reviews the city atlas book with Sam Brown, traffic investigator. Sign survey information was analyzed daily while it was fresh, and precise sign locations were transcribed from survey sheets into the atlas.

The first systematic traffic sign survey conducted in Sioux City has brought a bonus of safety to its residents and provided the city traffic engineering department with a continuing guide for methodical upgrading of traffic control signs.

This survey gave the traffic engineering department its first complete inventory of all sign locations. It pinpointed deficiencies and damaged signs and paved the way for progressive improvements. It brought about corollary studies of speed zones and thru streets which aided in the revision of our city traffic ordinances. As a result, we completed three large-scale improvements in less than six months: Complete stop sign protection for all thru streets; all speed limit signs on arterial streets fully reflectorized; all stop signs reflectorized.

Sioux City's sign survey required a total of 244 hours, including 146½ hours in the field. Investigators issued work orders daily to repair and upgrade signs requiring immediate attention and to ensure systematic upgrading of other signs.

Here's how we did it.

Dividing the city into four sections (central, east, north and west) we started a two-man team in the east section. Every city street open for traffic was checked. The team used specially-prepared forms which facilitated marking the location, size, reflectivity and condition of each type of sign as well as the condition of the post. Street name markers were not recorded unless they required immediate maintenance.

Highway information markers were excluded because they are erected and maintained by the state; however, we did record state regulatory and warning signs.

On the fourth day of the survey we split the two-man crew to one man per car and assigned each man to a different section. This increased productivity per man-hour. Rate of ground coverage almost doubled in the residential areas. However, a two-man crew was necessary in business areas.

After a week we analyzed the work we had done and transcribed into work orders those signs requiring immediate attention. Work orders issued daily enabled us to repair and upgrade all signs in the community in a systematic fashion, with assurance that no area had been missed.

After the first week we analyzed the information daily while it was fresh: precise sign locations could be marked better in our city atlas. Because our survey forms located a given sign only by the side of the street between intersections, the surveyors' memories were important in daily transcription to the atlas. Field work proceeded for several weeks on an intermittent basis; we interrupted the survey periodically under pressure of other work.

Table I gives a summary of the work required in each of the four sections, the dates, hours required in the field and the miles driven.

The atlas book provides a ready reference for the location of signs in any area—an invaluable reference we previously did not have. We discovered many conditions which required im-

TABLE I
SIGN INVENTORY SUMMARY

	East	West	North	Central	Total
Dates	6/15-7/1	6/18-7/10	7/6-7/10	7/20-7/23	
Field hours	62	44	23½	17	146½
Summary hours	22½	6	7	11	46½
Atlas book hours	12	15	11½	12½	51
Miles	218	255	155	71	699
Total hours	96½	65	42	40½	244

mediate change—obsolete yellow stop signs, unreflectorized stop and speed limit signs and dangerously damaged signs. Many signs had been vandalized or weathered to a point where they were no longer serving their function.

In this before-and-after summary of our findings on stop and speed limit signs, a sign was defined as non-reflective if it was not visible at night in full color, shape and legend. In future surveys, this classification will be broken into three categories (reflective; partly reflective; non-reflective) to allow a priority order of replacement. In Table II the remaining non-reflective (partly reflective) stop signs are on state highways, out of Sioux City's jurisdiction. Remaining 25 MPH residential signs will be reflectorized this summer.

The survey has been extremely valuable to us. We have been able to correct potentially dangerous situations and facilitate our sign maintenance, and we have gained additional benefits from our study of thru streets and speed zones. Our system of recording the sign inventory in atlas book form has been used extensively in preparation of new city traffic ordinances.

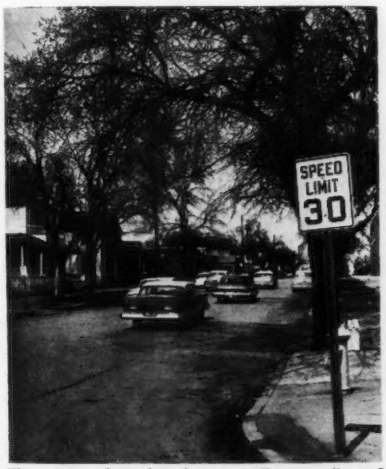
Because we must describe the location of all speed regulations, our study has enabled us to save considerable time by eliminating frequent trips into the field to record conditions. It has been equally helpful in studying time limits on parking, no parking areas, etc.

Sioux City has profited handsomely by the economies inherent in the applications of the systematic sign survey. But more important, our motorists and pedestrians have gained increased protection.

Each stop sign in Sioux City is brightly visible in full color, shape and legend at night. Complete reflectorization of stop and speed limit signs was a primary objective in the community's program to upgrade its traffic control devices.

TABLE II
AT TIME OF SURVEY

Sign	Per Cent Refl.	Per Cent Non-Refl.	Current Per Cent Non-Refl.
Stop	62.8	37.2	23.0
25 MPH	43.1	56.9	20.0
30 MPH	77.1	22.9	0
35 MPH	67.6	32.4	0
40 MPH	0	100.0	0
45 MPH	33.3	66.7	0
All speeds	57.2	42.8	10.0



The survey brought about corollary studies of speed zones and thru streets which aided in revision of city traffic ordinances. The survey gave the traffic engineering department its first complete inventory of sign locations. It pinpointed deficiencies and damaged signs and paved the way for progressive improvements.

In less than six months after the start of the sign survey, Sioux City had complete stop sign protection for all thru streets, all speed limit signs on arterial streets fully reflectorized, and all stop signs reflectorized.

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Traffic News

Traffic Engineering Awards Made by ITE

Two states, thirty seven cities and one metropolitan county have been honored by the Institute of Traffic Engineers for their traffic engineering work in 1959.

The awards, which were based on information reported to the Annual Inventory of Traffic Safety Activities conducted by the National Safety Council, were made by a committee of judges of the Institute. Chairman of the Committee was Thomas J. Seburn, a past president of the Institute and now associate director of the Yale Bureau of Highway Traffic; John E. Baerwald, associate professor of traffic engineering at the University of Illinois; Donald S. Berry, professor of civil engineering at Northwestern University; and Adrian H. Koert, traffic engineer with the Insurance Institute for Highway Safety.

Traffic planning, traffic control measures, traffic improvements, and traffic engineering administration were among the items considered in making the awards. Approximately 800 cities and all states submitted entries in the Inventory program, which is basically designed to provide a self-evaluation of the traffic safety program of the city or state. No ranking was assigned by the Institute to the awards, which were all designated as "for maintaining a high level of performance in traffic engineering."

The states receiving awards were California and Michigan.

The cities and the county receiving awards were: Arizona—Phoenix, Tucson; Arkansas—Little Rock; California—Los Angeles, Modesto, Newport Beach, Sacramento, Stockton, Sunnyvale; Florida—Dade County, Miami; Indiana—Fort Wayne, Indianapolis; Massachusetts — Boston; Michigan — Detroit, Grand Rapids; Minnesota—St. Paul; Missouri—Clayton.

Also New York—Syracuse; North Carolina—Charlotte, High Point; Ohio —Cleveland, Dayton, Shaker Heights; Texas—Austin, Corpus Christi, Dallas, Waco; Utah—Salt Lake City; Virginia —Alexandria, Richmond; Washington —Seattle, Tacoma; Wisconsin—Madison, Menasha, Milwaukee, Racine Wausau.

Keese Honored by Former Students At Texas A & M

Charles J. Keese, professor of civil engineering at Texas A & M, was one of six faculty members honored recently by a Faculty Achievement Award of $1,000.

The awards, established in 1955 by the Association of Former Students at Texas A & M, were given for distinguished achievement in teaching, student relationship and research. The award to Keese was designated for teaching.

A native of Texas, Keese graduated from A & M in 1941 and received his MS there in 1952. After serving in the Army during World War II, and some experience with the Texas Highway Department, he joined the A & M staff in 1948 where he has served almost continuously in teaching and engineering research.

An active member of the Institute of Traffic Engineers, Keese is currently head of Department 5 of the Technical Council. He has also been active in the Highway Research Board and last January shared in the "best paper" award for papers presented at the 1959 meeting of the Board.

New Film Released on Traffic Planning and Traffic Engineering

A new motion picture film has just been released, called "AUTO, USA," which features the need for sound transportation planning and traffic engineering at the community level.

The film, produced by Dynamic Films, Inc., New York, as a public service effort under a grant of funds from the Perfect Circle Corporation, Hagerstown, Indiana, was made with the help of an advisory committee of representatives from the Institute of Traffic Engineers, the Yale Bureau of Highway Traffic, the New York University Center for Safety Education, the Columbia University Safety Education Institute, and the Automotive Safety Foundation.

"Auto, USA" is a twenty-eight minute sound color motion picture on the myriad problems accruing from the rapid growth of the motor vehicle and suggestions for the solution of these problems. There are several specific objectives in the film: to show the slow strangulation of social and economic life in urban communities due to the increase in traffic; to demonstrate the importance of sound community planning in the field of transportation; to show how communities can ease their problems through good traffic engineering; and to encourage citizens to stimulate activity in their cities and towns for better and safer highway transportation.

A booklet, also entitled "Auto, USA," has been prepared to use either with the film or as a mailing piece for distribution later. Prepared by the advisory committee, the cost of the booklet was contributed by the Perfect Circle Corporation, and the booklet will be distributed by the Institute of Traffic Engineers from the Washington office of the organization.

Prints of the film (with a discussion guide) are available. Write Dynamic Films, Inc., 405 Park Avenue, New York, N. Y.

AAA Issues Highway Policy Statement

The American Automobile Association, noting that July 1, 1960, represents the fourth birthday of the Interstate Highway System, has recently adopted a statement of policy on the subject of a national highway program. The summary statement as released by the AAA reads as follows:

The American Automobile Association is a federation of 750 affiliated motor clubs and branches with close to 7 million members. AAA and its clubs have been profoundly and vitally interested in matters pertaining to good roads since the turn of the century.

At the moment, the ambitious highway program launched in 1956 is running into trouble. Next year, the Congress will have new facts before it both as to the cost of completing the National System of Interstate and Defense Highways and as to the basis on which to finance the entire Federal-aid highway program with equity to all. It's clear that 1961 will be a year of major decision for roadbuilding in America, with all its impacts and potentialities for the general welfare, for the national defense, for the easing of urban congestion and resultant blight and for the unceasing war against traffic accidents. Highways constitute one of our

most urgent and important domestic issues. On the basis of long experience and intensive study of the problem, we in AAA believe that the best interests of the motorists and the nation as a whole will be served by a highway program built along the following lines:

First: It should be a *balanced* program. While placing great emphasis on the 41,000-mile Interstate system, which should be completed as expeditiously as possible, we should not overlook or neglect the needs of the regular primary, secondary, and urban routes making up the so-called ABC systems.

Second: The future program should contemplate *steady forward progress.* Hurry-up-and-slow-down and feast-or-famine methods in recent months have demonstrated their great potentialities for disaster. To the greatest extent possible, we should attempt to avoid these peaks and valleys in future highway programming.

Third: We should maintain the present balance of *Federal sharing.* Because of the national importance of the Interstate system, the Federal government should continue to put up at least 90 per cent of the total construction costs with most of the states contributing 10 per cent. Needs, rather than an arbitrary formula, should continue to be the basis for apportioning Federal funds. On other roads in the Federal-aid system, the distribution should be on an equal matching basis.

Fourth: We should maintain the concept of building modern expressways around, into and through *metropolitan areas.* In these areas nearly half of all highway travel takes place; from these areas comes half or more of all highway user taxes. Any attempt to de-emphasize or otherwise curtail the metropolitan area highway program should be most vigorously opposed. Such irrational ideas as charging tolls on city gateways deserve no serious consideration.

Fifth: We look to the Federal government for leadership in the direction of *tax equity.* There are two matters involved here:

(a) The equity of tax distribution as between passenger cars and the various types of commercial vehicles using the Federal-aid highways;

(b) The equity of tax distribution as between highway users and those who derive direct or indirect benefits other than from direct use. Highway users are grievously over-taxed already—their total special tax bill, in addition to all other standard taxes they pay, will amount to some $10 billion this year. Aside from general welfare, the Interstate system, as has been demonstrated in lengthy hearings before Congressional committees, is of vital importance to the national defense, both civilian and military.

Moreover, progress reports by the U. S. Bureau of Public Roads have identified large areas of special benefit. Highway users recognize that they are the principal beneficiaries of good roads. Yet many others benefit, too. Some avenue should be found to translate this collateral benefit into financial support of the Federal highway program. Users already are over-taxed. We need a broader tax base for this all-important Federal program of providing the types of roads and streets required to meet the traffic demands of today and tomorrow.

C. C. Wiley Award Winner Named

Thomas W. Kennedy, Paris, Ill., has been awarded the sixth C. C. Wiley Traveling Award in Highway Engineering at the University of Illinois.

He started June 20 on a 10,000-mile trip which will take him through 13 Western States and to the Pacific Coast before he returns to the campus Sept. 1. He has 30 appointments in advance and will stop at many highway projects and offices.

Hundreds of color slides which he makes will be used in the university's civil engineering classes. He also will write a detailed report.

The General Paving Co., Champaign, headed by Paul F. Kent, a U. of I. civil engineering alumnus, annually gives the $1,200 award honoring Prof. C. C. Wiley, pioneer in highway engineering, who retired in 1952 after 46 years on the university staff.

The winner is chosen principally on excellence in a class project for seniors in highway design, but also considered are scholastic standing and personal characteristics.

Kennedy, 22, was born in Danville, attended junior high school there and high school in Paris where his father is district engineer of design with the Illinois Division of Highways.

He studied for two years at Eastern Illinois University, Charleston, and completed his degree at the U. of I. this year. While in college he worked one summer for a highway contractor and two for the Illinois Division of Highways.

Thomas W. Kennedy (right), winner of sixth C. C. Wiley Traveling Award in Highway Engineering at University of Illinois, discusses his 10,000 mile trip through 13 states with Prof. Wiley in whose honor the award is given annually.

Next fall he will be a graduate student and research assistant at Illinois, working on studies to determine desirable widths and cross sections for medians of divided highways.

IRF to Sponsor Spanish TE Text

International Road Federation has formed a Spanish Traffic Engineering Manual Committee to select traffic engineering texts for translation from English into Spanish.

The selected translations would comprise a basic traffic engineering manual that could be given practical utilization and serve at the same time as an academic reference in Spanish-speaking countries.

The translator is Guido Radelat, formerly of Cuba, who will do his work at Northwestern University under a grant from the International Road Federation.

Membership in the new committee is composed of Fred Hurd, director, Bureau of Highway Traffic, Yale University; Harmer E. Davis, director, Institute of Transportation and Traffic Engineering, University of California; Donald S. Berry, Professor of Civil Engineering, Northwestern University; Miguel Montabes, secretary general of the Spanish Highway Association; Rafael Cal y Mayor, director general of the Mexican Operators Training Center; George W. Howie, director, Department of Public Utilities of the City of Cincinnati, representing the Institute of Traffic Engineers; and Robert O. Swain, executive director, International Road Federation.

Texas A & M Announces Expanded Program

The current demand for motor vehicle transportation has created serious problems of congestion and safety on the highways and urban streets of the United States. Highly trained and specialized highway and traffic engineers are vitally needed to cope with these problems. In order to meet this increasing need, an expanded graduate program offering a wide range of study opportunities in both highway and traffic engineering has been developed at the A. and M. College of Texas.

This expanded graduate program will be administered primarily within the Department of Civil Engineering, but will be supported with courses in electronic data processing, statistics, mathematics and other related areas. Candidates for the degrees of Master of Science, Master of Engineering, and Doctor of Philosophy in highway and traffic engineering will be afforded an opportunity for a wide selection of course work.

Numerous combinations of closely related fields of study are available within the Department of Civil Engineering. These include highway design with supporting courses in traffic engineering; traffic engineering with supporting courses in highway design; highway or traffic engineering with supporting course work in highway structures, materials, soils, municipal engineering, or other related areas.

Research assistantships in the amount of $2700 and fellowships in varying amounts are available for qualified graduate students. Information on assistantships and fellowships and about the program in general may be obtained by writing: Charles J. Keese, Professor of Highway and Traffic Engineering, Department of Civil Engineering, A. and M. College of Texas, College Station, Texas.

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Catholic University Offers Graduate Courses

Catholic University (Washington, D.C.) has announced a program of graduate studies leading to the degree of Master of Civil Engineering. This program offers advanced students an opportunity to pursue further study in the field of highway engineering, and qualified students may take individual courses without necessarily pursuing a full master's-degree program. Early evening courses are offered as a convenience for persons employed during the day.

Required courses for the degree program include those in traffic engineering (3 hours), highway economics and finance (3 hours), highway design (3 hours), city planning (3 hours) and highway administration (3 hours).

For further information, write: Head, Department of Civil Engineering, The Catholic University of America, Washington 17, D.C.

Certification of Technicians Proposed

Establishment of an Institute for the Certification of Engineering Technicians and Engineering Technologists has been approved by the Board of Directors of the National Society of Professional Engineers.

The National Society will organize and operate the Institute to:

a. Determine by examination, endorsement, or otherwise, the qualifications of all persons who apply for certification.

b. Grant a certificate in the appropriate grade to applicants who successfully meet the criteria for certification.

The Institute, which is to be exclusively an examining body, will be operated by a board of directors comprising equal numbers of registered professional engineers and certified engineering technologists.

A. C. Friel, Midland, Michigan, chairman of the National Society's Committee on Engineering Technicians, told the group's Board of Directors that the establishment of the Institute "should provide a much needed means of recognizing the status of technician members of the technological team."

Friel pointed out that the Institute "should also lead to the upgrading of the education and work experience, as well as the continued self-development of the technician."

Authorization for the Institute was voted at the 26th annual meeting of the 56,000-member National Society, June 8-11, in Boston.

Transportation Agency Created

Transportation in the National Capital region took a great step forward with the creation of the National Capital Transportation Agency. On July 14, 1960, President Eisenhower signed legislation establishing the Federal agency, just one year and five days after he received the Planning Commission and Regional Planning Council's joint report, entitled *Transportation Plan—National Capital Region.*

The Agency's main purpose will be to develop a rapid transit system for the metropolitan area, but the Agency will carry on a total transportation planning program for the region as the basis for its transit decisions. Of immediate interest to traffic engineers will be the transportation engineering and related positions likely to be available when staff organization begins late in August. But of long-range importance is the opportunity here to up-grade the whole transportation engineering profession. The Congress has set the sights of the Agency on a high level by recognizing the depth and importance of urban transportation.

P & K TRAFFIC CONTROL REPORT

TOP PHOTO: Denver, Colo.; Combination lighting & traffic signal mast arm standards.

BOTTOM PHOTO: Orange, N. J.; Twin trombone arm traffic type standard.

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New Appointments

Hall Leaves San Diego For New Post in Phoenix

Edward M. Hall (Mem., ITE) has been named Street Improvement Administrator for the City of Phoenix, Arizona. He moves to Phoenix after five years with the City of San Diego and three years with the County of San Diego, where he was County Traffic Engineer.

Hall is well known for his work in the field of urban transportation planning. San Diego served as a proving ground and first pilot city for the National Committee on Urban Transportation, and the practical nature of the manuals growing out of the work of the National Committee was to a considerable extent due to the work done in that city. In the past few years, the functions of transportation planning and traffic engineering have been combined under Mr. Hall in San Diego, with resulting efficiencies.

In Phoenix, Hall will be in a newly created position in the office of the City Manager, with the broad objective of developing the street transportation system of Phoenix, a city of 187 square miles and 440,000 people. In his new position, Hall will be responsible for the development of local streets, construction of collector and major streets, and the coordination and development of a freeway system for the urban area. He will in effect be an assistant city manager for streets, with emphasis on developing public support, financing, and coordinating and expediting the city program for street improvements.

A graduate of North Carolina State College and the holder of the degree of Master of Engineering from the University of California, Hall is a member of ASCE and APWA in addition to his ITE membership. He has been active in Institute affairs, both as member and chairman of national technical committees and as a committee chairman for the Western Section. He has also been active in work of the Department of Traffic and Operations of the Highway Research Board and, as mentioned earlier, in the work of the National Committee on Urban Transportation.

Field Services Director Named at MSU Center

The appointment of Bruce B. Madsen as assistant director for field services of Michigan State University's Highway Traffic Safety Center has been announced by Gordon H. Sheehe, Center director.

Madsen will assume the field services responsibilities relinquished by J. Carl McMonagle, an assistant director of the Center, who will thus be enabled to enlarge his engineering activities.

Responsibilities for working policies and procedures to guide and coordinate the Center's varied field service activities throughout the state will be under Madsen. Included in these activities are the establishment of local safety councils; assistance to communities in setting up special training or educational programs; conducting various types of traffic studies and surveys; and help in developing materials and providing technical assistance as requested by communities and agencies in Michigan.

Madsen, formerly of Salt Lake City Utah, joined the Center's field services staff in 1957 following his graduation from Michigan State University. He was the nation's first graduate in highway traffic administration, having completed the newly established curriculum program initiated by Michigan State University to provide special traffic safety career training. Madsen is currently completing advanced degree work under this unique program.

Capshaw Appointed Associate TE in Albuquerque

Bobby Frank Capshaw (Jun. Mem., ITE) has been named Associate Traffic Engineer for the City of Albuquerque, New Mexico.

Before coming to Albuquerque, Capshaw was a traffic designer with the Texas Highway Department, stationed in Austin. Earlier he had served as engineering aide and traffic signal technician for the City of Lubbock, Texas.

A civil engineering graduate of Texas Tech, Capshaw was a radio mechanic for the Army for two years prior to his college career.

Job Changes

Charles L. Baule—formerly Civil Engineer of Highways with the Chicago Bureau of Streets, Chicago, Illinois; is now a Civil Engineer with the La Crosse Dredging Corp. of Chicago, Illinois, located at present in Dubuque, Iowa.

Bobby Frank Capshaw—formerly Traffic Designer with the Texas Highway Department in Austin, Texas; is now Associate Traffic Engineer with the City of Albuquerque, New Mexico.

Arthur C. Gibson—formerly Traffic Engineer with the Department of Streets & Traffic in Detroit, Michigan; is now Secretary to the Mayor of the City of Detroit.

Robert J. Hansen—formerly Computer Engineer with the Washington Department of Highways in Olympia, Washington; is now the Technical Specialist, Data Processing Sales Division with IBM in Sacramento, California.

Stephen G. Petersen—formerly Principal Traffic Engineer with the New Jersey Bureau of Traffic Safety in Trenton, New Jersey; is now Staff Engineer with the Institute of Traffic Engineers at Headquarters in Washington, D. C.

Claude A. Rothrock—formerly with the Engineering Section of the Ohio Department of Highways in Columbus, Ohio; is now Assistant Director of the Planning and Traffic Division, State Road Commission of West Virginia, in Charleston, West Virginia.

Murray D. Segal—formerly Senior Engineer with the National Safety Council in Chicago, Illinois; is now

Traffic Engineer with the Department of Legal Medicine at Harvard Medical School in Boston, Massachusetts.

Richard C. Thomas—formerly Senior Assistant Traffic Engineer with the City of Cleveland, Ohio; is now Traffic Engineer II in the Planning Office of the City and County of Denver, Colorado.

James E. Watt, Jr.—formerly Traffic Engineer with Edwards & Kelcey in Boston, Massachusetts; is now Highway Planning Engineer with the Penn-Jersey Transportation Study in Philadelphia, Penna.

Title Changes

Eric A. Mohr—is now Senior Transportation Engineer with the California Public Utilities Commission in San Francisco; was Associate Transportation Engineer.

Coming Events

September 11-16—ILLUMINATING ENGINEERING SOCIETY—
National Technical Conference, Penn-Sheraton Hotel, Philadelphia, Penna. Contact: IES, 1860 Broadway, New York City.

September 12-16 — INSTITUTE OF TRAFFIC ENGINEERS—
30th Annual Meeting, Edgewater Beach Hotel, Chicago, Ill. Contact: ITE, 2029 K St. N.W., Washington 6, D. C.

September 19-22—INTERNATIONAL MUNICIPAL SIGNAL ASSOCIATION—
Annual Meeting, Astor Hotel, New York City. Contact: Irvin Shulsinger, IMSA, 130 West 42nd Street, New York 36, N.Y.

September 26-30—FIFTH INTERNATIONAL TRAFFIC STUDY WEEK—
Nice, France. Contact: M. H. Perlowski, Secretary to the OTA/PIARC/IRF Joint Committee, 32 Chesham Place, London S.W.1, England.

October 9-12—AMERICAN TRANSIT ASSOCIATION—
Annual Meeting, Sheraton Hotel, Philadelphia, Penna. Contact: ATA, 355 Lexington Ave., New York, N. Y.

October 9-13—AMERICAN SOCIETY OF CIVIL ENGINEERS—
Annual Convention, Statler Hotel, Boston, Mass. Contact: ASCE, 29 West 39th St., New York, N. Y.

October 17-21—NATIONAL SAFETY COUNCIL—
National Safety Congress and Exposition, Hilton, Congress and other hotels, Chicago, Ill. Contact: NSC, 425 N. Michigan Avenue, Chicago 11, Ill.

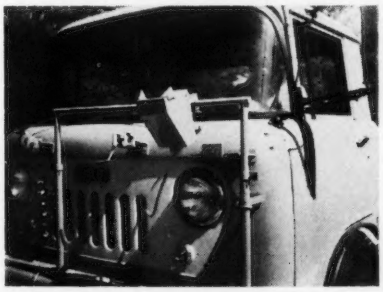
November 28-December 2—AMERICAN ASSOCIATION OF STATE HIGHWAY OFFICIALS
Annual Meeting, Sheraton-Cadillac Hotel, Detroit, Mich. Contact: AASHO, 917 National Press Bldg., Washington 4, D.C.

Strictly Business

Wald Introduces Optical Pointer

Wald Industries, Inc., Huntingdon, Pa., has made the long, projecting guide arm on striping machines obsolete with a new optical pointer.

Perfected by Wald engineers after months of research and testing, the optical pointer fits snugly below the windshield of the striping machine cab. It is especially practical in confined city projects where the old, projecting guide tended to be unwieldy.



The optical pointer allows the operator a choice of reference line such as the medial strip, edge line, or center line.

P & K Catalog is An Engineering Brochure

A new catalog from Pfaff and Kendall, "P & K Aluminum Lighting Standards," will be of interest to engineers because it is more of an engineering handbook than a sales catalog.

Designated as "ALS-5," the new catalog is 16 pages in length and includes nearly 30 detailed drawings. The specification data in the publication are designed to help the traffic lighting engineer match the lighting standard with the luminaire to provide the desired light intensity for a wide range of applications.

The standards have been divided into categories according to the projected surface area (wind load) of a luminaire as a guide to specification of the correct standard to support it properly. The catalog lists and details single member tapered elliptical arm standards, truss member tapered elliptical arm standards, single member and truss member up-sweep arm standards, fluorescent standards, low mounting height standards, as well as bases, accessories, anchorages and various modifications.

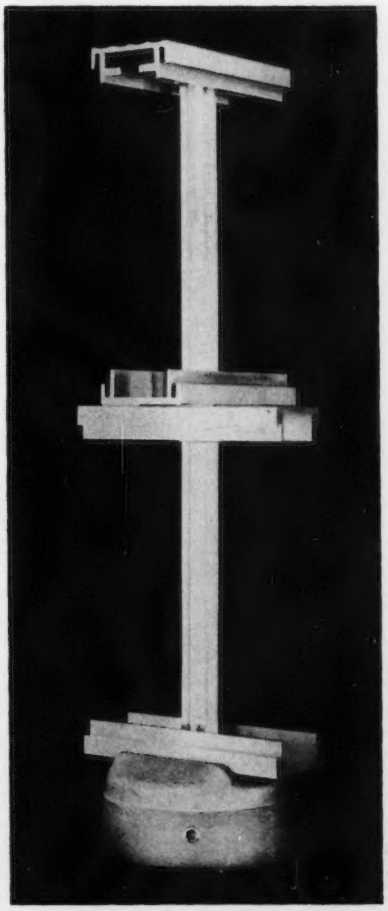
Copies are available upon request to Pfaff and Kendall, 84 Foundry Street, Newark 5, N. J.

Cameo Introduces All-Aluminum Hardware For Signs

California Metal Enameling Company, Los Angeles, California, manufacturer of porcelain enamel signs, announces all-new, all-aluminum hardware for street signs. Hugh Penton, vice-president of CAMEO, states that the aluminum hardware represents a major step forward in the street name signing field.

CAMEO's all-aluminum hardware combines clean, functional design with rugged durability equaling the lifetime quality of the company's porcelain enamel signs, according to Mr. Hugh Penton.

Interesting feature of the new CAMEO hardware is a "theft-proof" saddle cap, which replaces the old finial-type assembly. Also unique is the star-shaped ¾" extruded center rod.



The 8-pointed star shape makes a positive and simple method of adjusting the angles of the sign faces to correspond with the installation on the street intersections. Matching holes in the extruded saddles lock the rod in place.

Ease of assembly and maintenance-free duty are added features, Penton stated.

The new CAMEO aluminum hardware is available for top of pole crisscross, cantilever, and cantilever crisscross at sides of pole. All types will fit both 6-inch and 9-inch plates. Prices are competitive with steel and other commonly used hardware metals.

California Metal Enameling Company, is located at 6904 East Slauson Avenue, Los Angeles 22, California.

Duncan V.I.P. Meters Win Approval

Successful completion of extensive field tests of the new vandal-resistant Duncan V.I.P. Parking Meter has been announced by the Duncan Parking Meter division of Motor Products Corporation.

R. J. Smott, director of sales of the Motor Products parking meter division, said the new meter, now in full production, will solve the dual problem of parking meter pilferage and damage by vandals. During field tests in four cities for periods ranging up to five months, there were no reported instances of theft from the coin vault or vandal-caused damage to the housing or operating mechanism.

Smott also said that the V.I.P. (for Vault Insured Protection) has become the first parking meter authorized to carry the label of Underwriters' Laboratories, Inc. Underwriters' Laboratories tested the meter's ability to function normally under difficult conditions as well as its ability to withstand attacks by vandals.

Results of hammer test on Duncan V.I.P. meter are studied by Louis P. Farina (left), Chicago superintendent of parking; Arthur W. Wunsch (center), director of production for Duncan Parking Meter Division of Motor Products Corp., and James P. Chambers, Chicago supervisor of parking meters. Three-pound hammer previously swung by Farina left only impact marks on door of malleable cast iron coin vault.

The most extensive field test was conducted in Baltimore, where 50 V.I.P.'s were installed in the city's most vandal-prone districts. In five months of operation, all 50 meters remained inviolate.

Smott said the city as a whole normally experiences upwards of 20 cases of parking meter vandalism daily, with the number going as high as 150 per day at times. He noted that cities the size of Baltimore are forced to spend an average of $25,000 monthly for meter replacement parts, primarily to repair vandal-caused damage.

Similar trouble-free results were obtained in V.I.P. tests in Chattanooga, Nashville and Buffalo.

Features that make the V.I.P. the answer to the problem of vandalism include a burglar-resistant housing, a tamper-proof bolted door and Duncan's exclusive "mystic-lock."

The meter combines the appearance of a miniature bank vault with the ruggedness associated with its full-scale prototype.

Prismo Markings Demonstrate Long-Life

A greatly improved permanent-type reflective pavement marking material that virtually ends traffic interference and delay during application, and wears for years instead of months, is now being used with outstanding success in such cities as Baltimore, Md., Macon, Ga., and Harrisburg, Pa., according to the manufacturer.

The new "SD" Plastix manufactured by Prismo Safety Corporation, pioneer of the reflective process in pavement marking materials, has a special adhesive backing perfected after years of research and testing. The backing permits simple, quick application by unskilled labor, since no advance preparation of the pavement is required. Traffic flow can continue while the installation is being made, ending long waits required by other marking materials to dry or set.

The Department of Transit and Traffic in Baltimore, Md., has installed nearly one-half million 6 x 6 blocks of Plastix. The city was one of the first and largest users of the old-style Plastix which required brushing an adhesive on the pavement and on the Plastix blocks, and has now turned to the new, "SD" Plastix with excellent results.

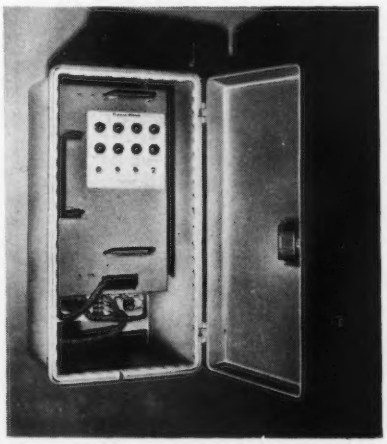
Permanent-type Prismo "SD" Plastix markers are used throughout the downtown section of Harrisburg, Pa., by Traffic Engineer Eugene Simm. The reflective markers shown in this unretouched photograph have withstood a year of heavy use, surviving intense heat and a hard winter with its snow, ice, cinders, chains and snow ploughs.

"Just from an installation standpoint alone," Henry A. Barnes, Baltimore Traffic Commissioner said, "we found we could put down as many of the new blocks in 30 days as we formerly could with the old style in 90 days. . . The savings in labor is extensive."

The new material is furnished in continous rolls, in 6 x 6, or 6 x 4 blocks, in "Dotties," and in pre-cut legends for school zones, lane lines, turns, and the like. It is available in both white and yellow.

New Crouse Hinds Actuated Traffic Controllers

Crouse-Hinds has introduced a complete new line of vehicle-actuated traffic control equipment, featuring semi-vehicle-actuated (SVA Series) and fully-vehicle-actuated (FVA Series) controllers. All of the new units are designed to provide a flexible traffic control system with many convenient fea-



tures. Each basic controller is designed and wired to accommodate a wide variety of accessory units. Additional accessories may be added at any time, to keep pace with changing traffic control needs.

All components of the new controllers are of the highest quality. A motor-driven cam unit offers maximum flexibility with minimum number of relays. All relays are jack-mounted. The completely new cam unit has silver cadmium oxide contacts, rated at 10 amperes. Gold plated contacts are used on the timing circuits. These contacts require no adjustments.

Rigid cam shaft having double shielded ball bearings with lifetime silicone lubricant reduces maintenance. Cam unit, secondary panel, recall and signal shutdown switches, control dials for interval timing are mounted on the main hinged panel which swings out for complete accessibility. A dust cover, protecting the timer mechanism, is held in place by simple snap catches.

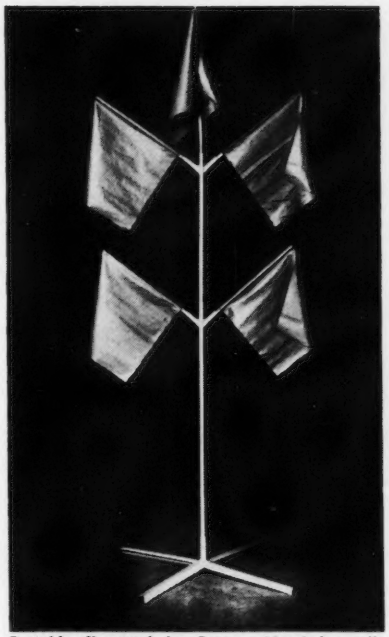
Electronic components are mounted on a hinged secondary panel which may be swung away from the face plate for servicing. Detachable wiring plug electrically connects the timer to the rear panel on which special features may be mounted. Color-coded wiring and stockinged wiring harnesses are used throughout the controller. Two handles are mounted on the timer to protect the timing knobs and to facilitate handling.

The controllers can be used with pressure-sensitive, magnetic, radar, or ultra-sonic detectors.

For complete information and listings of the new equipment, write to Crouse-Hinds Company, Syracuse 1, New York.

New Flagstand for Long Range Visibility

A new design in portable Flagstand that offers visibility as far as 600 yards for greater safety has been announced by Eastern Metal of Elmira, Inc., Elmira Heights, N. Y., manufacturers of traffic control signs and equipment. The complete unit consists of an X base with an 80″ high flagholder that holds 5 flags. The finish is yellow baked enamel and flags are brilliant red-orange fluorescent color in a big 18″ x 18″ size. Tests have shown that added visibility of Eastern Metal Utility Flagholder is particularly useful for special work areas such as utility construction, near truck or car traffic.



Portable flagstand by Eastern Metal is easily assembled to hold five red-orange fluorescent flags. Added visibility plus easy portability make this new design particularly useful for special work areas where mobility of signs is needed.

Cost of the complete unit is $19.95. Weight is 23 lbs. and the flag and flagholders disassemble for compact storage.

The new utility flagstand is available through Eastern Metal Utility Sales Companies and Safety Equipment Dealers or for further information write to Eastern Metal of Elmira, Inc., Elmira Heights, N. Y.

Rockwell-Standard Subsidiary Expands

In a major expansion move, Kerrigan Iron Works Company, a wholly owned subsidiary of Rockwell-Standard Corporation is now installing machinery and equipment for the manufacture of seamless, round-tapered aluminum lighting standards. This announcement was made by Mr. C. A. Cooper, Vice President of Rockwell-Standard Corporation, in charge of the Company's Miscellaneous Products Group—and responsible for the overall operation of the Kerrigan subsidiary. He stated that this expansion rounds out the firms line of lighting standard products and will enable Kerrigan to obtain a larger share of this growing market.

Mr. Cooper also commented that most of the nation's streets and highways are inadequately lighted, but that through such activities as the press, utility and municipal promotions, the general public is now becoming increasingly aware of the benefits of well lighted streets. As examples, he cited articles in the February issue of Coronet magazine and the June issue of Readers' Digest on how well lighted streets have reduced crime and traffic fatalities at night in a number of cities.

In discussing this new operation, Kerrigan's General Manager, Stephen N. Krist, stated that in this process the shaft is formed from aluminum tubes by the spinning method and that this type lighting standard is frequently specified for the new Federal superhighways . . . principally for lighting interchanges, bridges, entrance and exit ramps and areas of driver decision . . . in addition to streets and parking areas generally. With the addition of the round aluminum pole, Kerrigan now manufactures a complete line of steel and aluminum equipment—shafts in both the round and octagonal tapered designs, mast arms and brackets, traffic signal standards and strain poles, overhead sign and lane marker structures, floodlighting standards, and other area lighting shafts for service stations, campuses, estates and parking areas.

SIMULATION

(Continued from page 17)

essary to have a mechanism for representing the actions and interactions of the elements of the design. Also, it will be necessary to observe or scan the model, either periodically (such as every 10 seconds) or every time some event occurs (such as a vehicle arrival).[6] In general, the computer serves as the means or mechanism of carrying out this step. No further discussion of this step will be made at this time, though, as it is felt that any questions can best be clarified in the next part of this paper.

These initial remarks have, of course, only set the framework for developing and following through an actual simulation experiment. The next part of this paper will present such an experiment. It will illustrate the simulation of the merging maneuver between entering ramp traffic and the through traffic on a freeway. Each step in the process will be described and an attempt will be made to illustrate how an engineer might utilize simulation in an everyday design situation.

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6 Gerlough, D. L., "Simulation of Freeway Traffic by an Electronic Computer," Highway Research Board Proceedings, 1956, pp. 543 ff.

New Publications

Dictionary of Highway Traffic

By J. Stannard Baker and William R. Stebbins, Jr., published by the Traffic Institute, Northwestern University; 300 pages, illustrated, cloth bound, $6.00.

The need for better understanding and greater precision in the use of terms relating to highway traffic and traffic problems has been obvious for at least a decade. Specialized vocabularies have emerged for many groups —highway engineers, traffic engineers, vehicle manufacturers, regulatory agencies, legislators, and others—all of them concerned in various ways with highway traffic and safety. By developing separately and independently, these different vocabularies have produced widespread confusion and misunderstanding. They have, to an inestimable degree, handicapped the national effort to improve highway safety and reduce motor vehicle congestion.

Now, for the first time, the numerous technical vocabularies in the general highway traffic field have been brought together in a systematic fashion in a single volume. *Dictionary of Highway Traffic* is a consolidation of several technical languages, but most important: it systematically shows the differences and similarities among terms currently used by several or all of the groups involved.

The main purpose of this book is to improve communication among technical and specialized groups in the highway traffic field. The scope of the dictionary is limited essentially to the technical language most useful to all of them. For example, distinctions are drawn between such terms as "junction" and "intersection," "registration" and "licensing," and "supervision," "control" and "direction."

Terms and definitions were compiled from over a score of authoritative texts and glossaries. Many of these sources had included the same terms but had given them different definitions. In these cases the several definitions are presented in the dictionary along with discussion of their comparison and usefulness. About 10,000 terms are considered including the basic vocabulary, synonyms, antonyms, contrasting expressions, analogous forms, etc.

The book is extensively illustrated with over 80 line drawings and charts showing genera-species and classificatory relationships between technical terms used in highway traffic.

Dictionary of Highway Traffic will be an indispensable reference and guide for highway planners, traffic engineers, vehicle manufacturers, lawyers, educators, police officials, judges, prosecutors, driver-license and motor vehicle administrators, journalists, armed forces personnel, students, legislators, mayors and city managers, and others.

A Model Performance Specification for Purchase of Pavement Marking Paint

Technical Report No. 4, Institute of Traffic Engineers, 2029 K Street NW, Washington 6, D. C. January 1960. 14 pp. $0.50.

This report was developed by Committee 7-D of the Institute of Traffic Engineers after several years of work. It represents the first time any national group has agreed upon a performance

For Traffic Surveys...
THE TRAFICOUNTER, JR.
is a simple, sturdy, time-tested device for traffic counting. It is pneumatically actuated by means of the road tube attachment.
Traffic volume is easily read on direct reading counter. Can be rapidly installed anywhere. Rugged construction; will last for years.
Write for illustrated Bulletin.
TORONTO 18, ONTARIO E. A. HORTON SALES CO., 299 BERING AVENUE
THE STANDARD OF ACCURACY SINCE 1888
STREETER-AMET COMPANY
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Branches in Detroit, Pittsburgh, Allentown, Birmingham and Los Angeles

This all-steel overhead sign structure was erected in Yolo County, California, designed under the specifications of the California Division of Highways. (Specification Steel Co., Colton, California, made the signs you see here.)

Right direction . . . highway signs of strong, economical steel

You just can't beat *steel* highway signs for strength, economy and long life. They're economical because first cost is low and maintenance is minimum for the life of the sign. With steel signs and supports, you get the bonus of greater strength, which discourages expensive vandalism. Replacement costs are cut because strong steel can take more punishment. You have your choice of carbon, galvanized or extra-strong USS COR-TEN Steel which makes possible lightweight construction with excellent corrosion resistance.

You can't beat steel signs for versatility, either. Economical in all grades, steel signs of carbon or galvanized steel sheets or porcelain enamel on USS VITRENAMEL Sheets are available from manufacturers in the colors specified for the Interstate System. Normally, rainfall keeps porcelain enameled steel signs clean, bright and visible. Here in sunny California, they've added catwalks to facilitate easy washing of the sign faces. Steel signs and support members are easily fabricated by standard processes. Specify strong, economical steel signs and supports for your highway marking program.

USS, COR-TEN and VITRENAMEL are registered trademarks

USS **United States Steel**

specification for pavement marking paint, and should be of considerable interest to all cities and states looking for a suitable specification to guide the purchase of this frequently-used traffic engineering tool.

Sign Supports: Foundation Design

Bulletin 247, Highway Research Board, 2101 Constitution Avenue, Washington 25, D. C. April 1960. 35 pp. $0.80.

This bulletin contains three papers presented at the 38th Annual Meeting of the Highway Research Board, as follows:

"Foundations to Resist Tilting Moments Imposed on Upright Cantilevers Supporting Highway Signs," by W. C. Anderson, analyzes the problem by selecting a foundation of given dimensions in a given soil, choosing a neutral axis, then by integrating the soil resistance, both shear and moments are imposed.

"Tests of Tilting Moment Resistance of Cylindrical Reinforced Concrete Foundations for Overhead Sign Supports." by F. E. Behn, describes the construction and testing of cylindrical foundations of reinforced concrete approximately 32 in. in diameter, 8 and 12 ft. deep in three soil types classified as plastic, granular and organic.

"A Device for Evaluating Horizontal Soil Resistance for Overhead Sign Supports," by W. C. Anderson, describes the apparatus consisting of two partial sections of a cylinder each 12 in. long and 4 in. wide, with a 6-ton hydraulic jack between. The device is lowered in an 8-in. auger hole at desired depths, initial readings are taken, then additional pressure is applied until the desired deflection is reached.

The Municipal Year Book, 1960

Orin F. Nolting and David S. Arnold, editors. International City Managers' Association, 1313 East 60 Street, Chicago 37, Illinois. June, 1960. 590 pp. $10 postpaid.

The broad range of municipal activities in the United States is examined anew in the 27th annual edition of the *Municipal Year Book* just off the press. This authoritative source book on local government covers the range from municipal organization to the many functions performed by cities, towns, and villages throughout the country.

New topics covered in the 1960 edition include parking lots and meters in more than 1,000 municipalities over 10,000 population with data provided on number of parking lots and spaces available, whether a fee for use of a lot is charged, the number of parking meters, time limits, and rates.

The regular sections of the *Year Book* provide all-new information on special censuses for cities over 5,000 population, zoning requirements for off-street parking, prohibition of overhanging signs in business districts, and city practices in providing uniforms or allowances for firemen and policemen. Other up-to-date information features personnel organizations, financial statistics, police and fire data, directories of city officials, bibliographies in various fields, and model municipal ordinances.

In all, there are 21 major tables containing a vast amount of information about individual cities. This information is analyzed and summarized. Consolidated data are provided for groups of cities classified according to population groups.

A Policy on U-Turn Median Openings on Freeways

American Association of State Highway Officials, 917 National Press Building, Washington 4, D. C. 1960. $0.25.

An official policy developed by the AASHO Committee on Planning and Design Policies to cover U-turn median openings on freeways.

Publication Index—1956-59

Highway Research Board, 2101 Constitution Avenue, Washington 25, D. C. 1960. 129 pp. $2.60.

This index is a supplement to the one published in February, 1960, which covered reference to all of the principal publications of the Highway Research Board including the papers and reports given at the first 38 annual meetings of the Board as well as numerous additional items, and a 1950-1955 supplement published in 1956 containing references to papers and reports presented at the 29th through 34th annual meetings, together with other items published during the period covered.

The present volume contains references to papers and reports presented at the 35th through 38th annual meetings, together with other items published during the period covered. Included are the following items from the several series of Highway Research Board publications:

Proceedings: Vols. 35-38 (1956-1959)
Bulletins: 22R, 129-248
Special Reports: 11C, 11D, 23-52
Research Reports: 17B, 18C
Bibliographies: 18-24
Current Road Problems: 13-2R
Roadside Development Reports: 19-56-1959
Highway Research Review: 4A, 4B

A separate index is published for the Research Correlation Service circulars.

The index consists of two sections: a subject index and an author index. The principal subject headings are given in the table of contents, which also contains cross references to facilitate the use of the index.

Positions Available

PHOENIX, ARIZONA

Position: Traffic Engineering Supervisor, for professional traffic engineering and supervisory work.
Requirements: Experience in traffic engineering, including supervisory duties. In applying, list several years of recent experience and include chart of present organization identifying your position and showing number of employees in each class.
Salary: $600 to $690 per month, with liberal fringe benefit credits.
Apply: Write within five days of receipt of this publication to Leroy J. Brenneman, Personnel Director, City Hall, Phoenix, Arizona.

FRESNO, CALIFORNIA

Position: Traffic Engineering Assistant, to act as assistant traffic engineer in a growing California city, with a population of 133,000.
Requirements: Bachelor's degree in Engineering or equivalent, with courses and experience in traffic engineering.
Salary: $595-$724. Second step after six months.
Apply: For further information and application form, contact Personnel Director, City Hall, Fresno, California.

KANSAS CITY, MISSOURI

Positions: Four Traffic Engineers and two Associate Traffic Engineers to plan and supervise various phases of traffic engineering program in the planning and design division and in the operations division of an aggressive expanding traffic agency. Positions open require special training or experience in one of the following fields: Freeway Design and Operation, Accident Analysis, Traffic Signal Control Systems and Geometric Redesign of Existing Intersections.
Salary: Traffic Engineer—$615-$780; Associate Traffic Engineer—$585—$675.
Merit System: Examination required. Possibility of starting above minimum salary depending on training and experience.
Apply: Forward resumé of experience and training to Director of Traffic, City Hall, 12th & Oak Streets, Kansas City 6, Missouri.

(Continued on page 40)

Technical Notes

CONTROL OF ERRATIC TRAFFIC FLOWS

A Discriminating Relay Is Installed To Compensate For Directional Movement

By Julian Scheineson, Traffic Control Engineer
Dept. of Public Utilities and Traffic, City of Cincinnati

When the city of Cincinnati was confronted with the problem of providing a method of controlling directional vehicular flow at a major intersection on the periphery of the central city, a discriminating relay system was incorporated into the existing traffic signal operation.

Columbia Parkway, Fifth Street and Pike Street is a multiway intersection with an average daily traffic volume of 19,068.

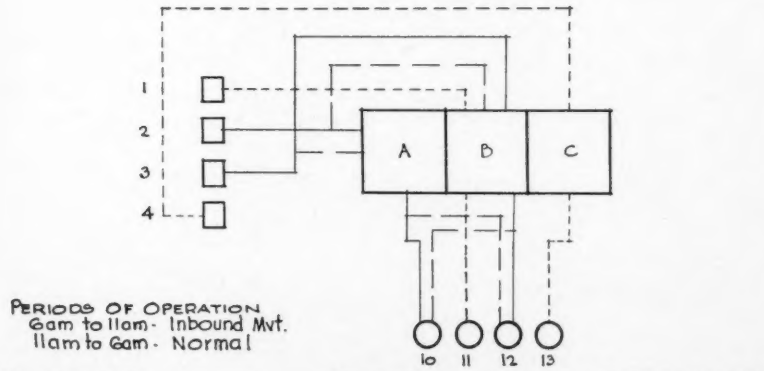
Traffic counts and observations indicate that the critical times of day are the usual morning and evening peak hours; that there is a heavy left turn movement during the morning from Columbia Parkway into Pike Street. Each platoon, on its approach to the intersection, must clear safely and conveniently with a minimum loss in waiting time.

This left-turn movement is confined to one lane because of geometric restrictions. Pike Street, one way southbound south of the intersection, has a bus stop located on the west side immediately adjacent to the intersection. It is established for the convenience of employees working in an office building located at the southeast corner.

A total of 3,728 vehicles enter the intersection between 7 a.m. and 9 a.m. In these two hours 1,648 vehicles (44% of the total) make the left turn. This maneuver is a simple access to the financial district, wholesale business areas and department store locations resulting in a higher volume density within the area.

Leaving the central city, Columbia Parkway and Fifth Street contains a pronounced outbound flow during the two evening peak hours between 4 p.m. and 6 p.m. Three outbound lanes carry a total of 906 vehicles per lane per hour. The inbound left turn, so heavy in the morning, now has a volume of 414 vehicles during the same two hour period.

Vehicular movements had been con-



PERIODS OF OPERATION
6am to 11am - Inbound Mvt.
11am to 6am - Normal

DETECTORS
1 Inbound
2 Left-Turn Inbound
3 Outbound
4 Left-Turn & 5th. St.

CONTROLLER SETTINGS
A · B · C

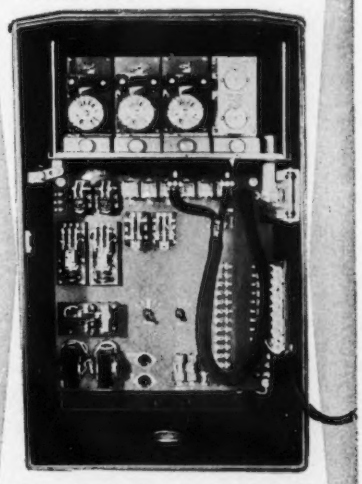
LEGEND
—— Normal
— — AM Operation
---- No Change

SIGNAL HEADS
10 - Left Inbound
11 - Inbound
12 Outbound
13 - Outbound & 5th. St. Left Turn

SCHEMATIC OPERATION OF TRAFFIC SIGNALS
COLUMBIA PKWY. - FIFTH ST & PIKE ST - CINCINNATI

M-35 SVAP
TRAFFIC CONTROLLER

- SYNCHRONOUS OPERATION WITHOUT SYNCHROLIZERS
- PEDESTRIAN ACTUATED INTERVAL
- VEHICLE CONTROLLED TIME EXTENSION
- ONE, TWO, OR THREE DIAL OPERATION



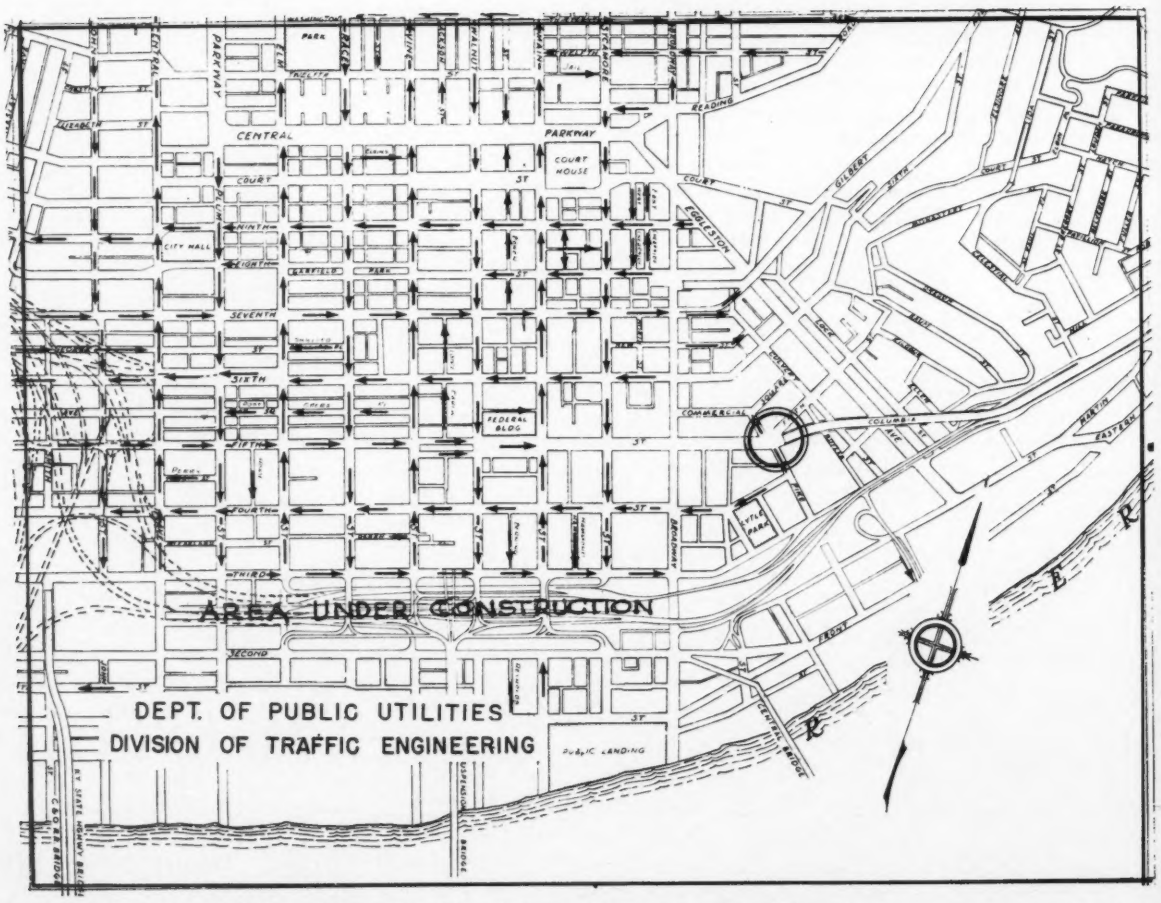
The Marbelite M-35 SVAP is a two phase, semi-actuated controller, electro-mechanical in operation, providing control flexibility greater than that available in other semi-vehicle actuated controllers.

For complete information, write

THE
MARBELITE
CO., INC.
173-179 NORTH 10th STREET
BROOKLYN 11, N.Y.
EVergreen 8-4742

An aerial view of Columbia Pkwy., Fifth St. and Pike St. during the early evening peak hour. Sixty-eight per cent of the total cycle is given to the eastbound movement leaving the central city during the evening peak hours to prevent the generation of a backlog into the core area.

Looking west from the left-turn lane, the left-turn signal and the signal for the through movements are energized.
For emphasis, the traffic signal units are outlined in white.



Columbia Pkwy., Fifth St. and Pike St. and its proximity to the central city is indicated on this vicinity map. The area under construction located south of the core area, will connect with Cincinnati's expressway system. Completion is expected within a year.

trolled by an isolated two-dial pretimed traffic signal. When demand increased and volumes became erratic, this operation lost its efficiency. It became evident through intensive study and observation that a three-phase traffic signal operation should be designed. A density-type dispatcher was installed to handle variable directional traffic flows. Plans were made and phase sequences drawn for complete traffic signal remodeling. These plans included the placement of a left turn signal head for the inbound movement.

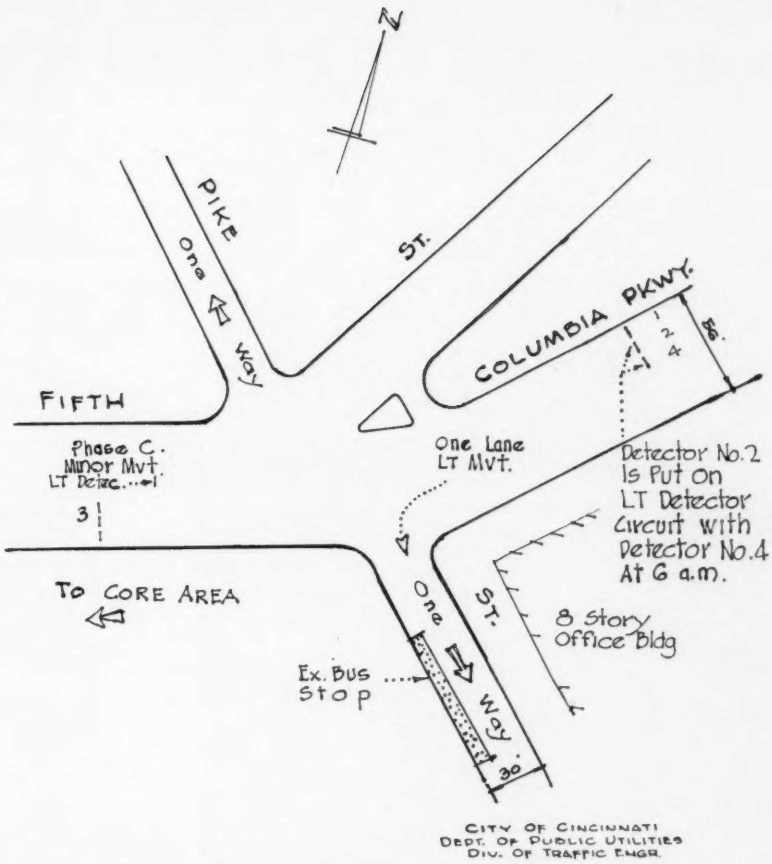
A study made after the signal was turned on, however, revealed that a simple three-phase volume density operation was inadequate. An additional installation of some type was necessary to accommodate the heavy inbound left-turn movement in the morning, and the important outbound flow during the evening. A discriminating relay system was decided upon.

At 6 a.m. the system is energized to favor the inbound left-turn operation from Columbia Parkway, and at 11 a.m. returns to its normal position until the following morning.

During normal periods of operation, Phase A controls timing intervals favoring outbound vehicular movements and inbound through movements. An A plus B overlap controls the left arrow upon vehicular demand. When no demand is evident, phases are skipped.

Phase C controls a relatively minor movement involving access to and from an area of light industry and railroad switching operations.

One hour before the start of the high volume density period, phases A and B are transposed although potentiometer settings remain unchanged. An additional detector circuit is cut in



Schematic layout of the intersection of Columbia Pkwy., Fifth St. and Pike St. in Cincinnati indicating the geometrics and the general operation of the intersection.

with the left-turn phase to assist in retaining extension periods and to keep the left turn energized as long as demand persists. Seventy-five seconds, however, is the maximum time allocated to this movement.

When the transfer is made, a latch-in relay closes the circuit during the yellow period in phase C. It is evident that the transfer is made during this period in the cycle to prevent the signal sequence from jumping directly from green to red. An operation such as this keeps the signal functioning in normal sequence during the transfer period.

The discriminating unit employs three-pole relays for the various traffic

The single left-turn lane approaching Fifth St. and Pike St. from the east, carries a total of 1,648 vehicles during the two morning peak hours.

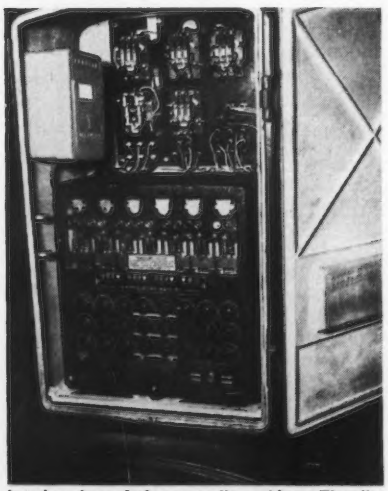
Looking west, the left-turn signal and the signal for the through movements are energized. A maximum of 75 seconds is allocated for the left-turn movements during the morning peak hours.

signal phases and yield circuits. A two-pole latch-in relay locks phasing changes in position until released by a switch at a pre-determined time.

Studies following installation of the discriminating relay system indicate that there has been a 50% reduction in waiting time. A 28% increase has been noted in the number of vehicles getting through the green indication in one cycle during the phase favoring the predominant traffic flow.

General view of the three phase volume density dispatcher at Columbia Pkwy., Fifth St. and Pike St. showing, on top, the installation of the discriminating relay.

In a separate cabinet below are shown various signal and detector relays.



Interior view of the controller cabinet. The discriminating relays are mounted on a panel above the volume density dispatcher. The top row, from left to right, are three-pole relays controlling the normal operation of Phases A and B, Phase A during the changeover period, and Phase B during the same operation respectively.

These relays control the left-turn signal timing and the outbound movement during the morning operation between 6 a.m. and 11 a.m.

The two relays on the bottom from left to right include the latch-in relay locking the operation until released by the time switch shown on the left wall of the cabinet above the dispatcher, and the relay for the left-turn signal operating on Phase B.

MUNICIPAL PARKING LOT LEAD-IN SIGNS

By Robert J. Kelly, Commissioner of Traffic and Parking Cleveland, Ohio

The American Municipal Association is an agency comprised of Mayors, Councilmen, Municipal Leagues and other municipal executives. In 1951, the A.M.A. created a Parking Committee under the able leadership of Mr. John McGillis, Director of the Detroit Parking Authority. From 1951 to date, this Committee has grown in importance, so that today it is more truly the "voice" of municipal parking than any other agency.

A prime function of this Parking Committee is the exchange of ideas between cities. In this "advisory capacity" the Parking Committee has held regular meetings and programed some subcommittee activities.

One of these subcommittees, under the chairmanship of Frederick M. Galloway of Califon, N. J., made a study of the variations existing among municipal parking lot lead-in signs. Since the municipal parking facilities are considered an extension of the street system of most cities, it is important that directional signs to these facilities be brought into uniformity in size, shape and design.

This Committee also asked for the recommendations of the National Joint Committee on Uniform Traffic Control Devices. The National Committee expressed a feeling that a parking area sign should be considered a local problem and that the sign has such special and limited application as not to justify its inclusion as a standard design in the Manual on Uniform Traffic Control Devices. In a letter to the A.M.A. Committee, the National Joint Committee on Uniform Traffic Control Devices stated:

"The Parking Area sign is a local problem.

"The Manual makes provision for miscellaneous information signs, and it was suggested that the Parking Area sign should be treated as one of these signs, for which standardization in detail is not necessary.

"The vote of the Committee was opposed to the inclusion of a standard Parking Area sign in the Manual on Uniform Traffic Control Devices."

Because the National Joint Committee refused to include such a sign in the Uniform Manual, or even to suggest a possible design, the Parking Committee has taken their recommendation to the A.M.A. Resolutions Committee. The A.M.A. Resolutions Committee, at their 1959 Denver Convention, adopted the following resolution:

Section 29-4 be amended by adding the following new paragraph:

"For some time, various members of the AMA Committee on Parking have believed that the use of a standard, easily identifiable directional sign indicating local parking facilities would be advantageous."

The following new section shall be created:

(Continued on page 42)

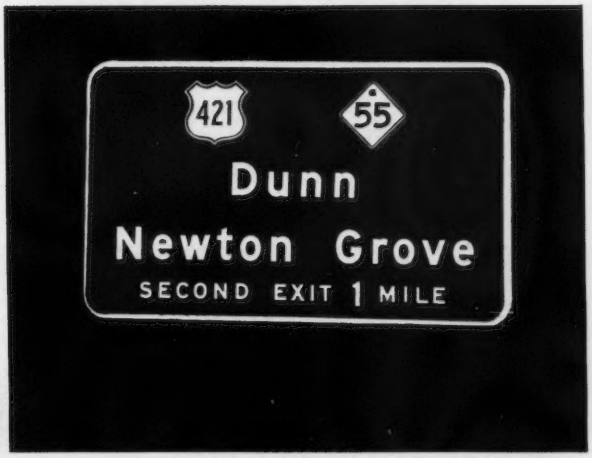
STANDARD DIRECTIONAL SIGN
for
MUNICIPAL PARKING FACILITIES
by
AMERICAN MUNICIPAL ASSOCIATION COMMITTEE ON PARKING

3M COMPANY
Reflective Products

signing NEWS AND VIEWS

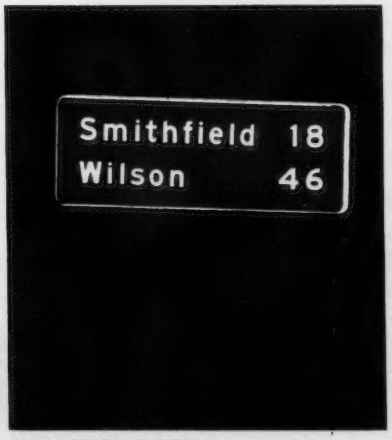
From the makers of "Scotchlite" Brand Reflective Sheeting, "Codit" Brand Reflective Liquid and other reflective products for modern traffic control and safety

GREEN IS GREEN DAY AND NIGHT ON N. CAROLINA'S INTERSTATE 95



CONSISTENT COLOR. Guide signs on North Carolina's Interstate 95 are always brilliant green—never appear dead black at night. That's because the backgrounds are reflectorized with vivid, all-weather "Scotchlite" Reflective Sheeting. And the basic elements of efficient signing—color, shape, and legend—are truly uniform, always look the same. For complete information on full-time sign performance, ask your 3M Representative or write: Reflective Products Division, Dept. RBI-80, 3M Co., St. Paul 6, Minn.

GOOD SIGNING is traditional in North Carolina—and as carefully engineered as the state's good roads.



REFLECTIVE COLOR identifies signs at long range, alerts motorists to prompt, safe action night and day.

COLORIMETER at 3M checks samples of "Scotchlite" Sheeting against color standard, assures uniformity.

MINNESOTA MINING AND MANUFACTURING COMPANY
. . . WHERE RESEARCH IS THE KEY TO TOMORROW

3M COMPANY

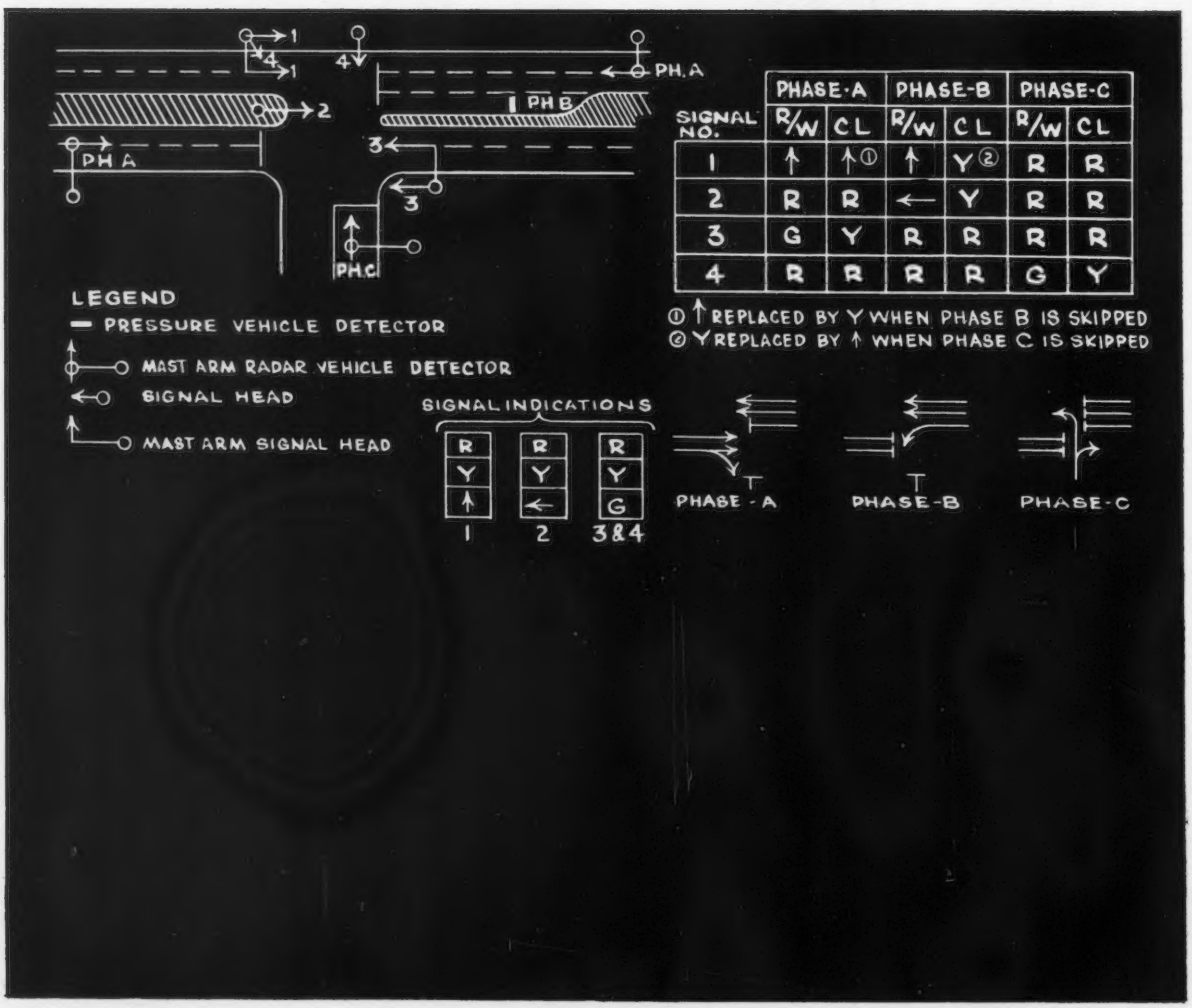
The terms "Scotchlite" and "Codit" are registered trademarks of the 3M Company

1826N SELECTIVE TRAFFIC SIGNAL OPERATION

Selective Signal Operation is traffic signal control that adjusts to moment-to-moment needs of the traffic itself rather than following a rigid, pre-set pattern of phase rotation and timing.

Model 1826N is a three-phase, full actuated signal controller. It provides selective signal operation by:

- giving green light only to intersection approaches that need it — skipping those momentarily clear of traffic.
- continuously dividing green light time according to the ratios of conflicting traffic flows — regardless of how widely and frequently those ratios vary.



SIGNAL NO.	PHASE-A R/W	PHASE-A CL	PHASE-B R/W	PHASE-B CL	PHASE-C R/W	PHASE-C CL
1	↑	↑①	↑	Y②	R	R
2	R	R	←	Y	R	R
3	G	Y	R	R	R	R
4	R	R	R	R	G	Y

① ↑ REPLACED BY Y WHEN PHASE B IS SKIPPED
② Y REPLACED BY ↑ WHEN PHASE C IS SKIPPED

(Continued from page 19)

d) The intersection or other location is suitable for signalization;

e) The nearest existing or proposed signal installation is more than 1,000 feet away.

The existing delay occasioned to pedestrians should be determined by a study at the location in question.

B 2.02.03 Accident Warrants

While an accident situation alone seldom justifies signal control, the installation of traffic control signals may be warranted when every one of the following conditions is satisfied:

a) At least five preventable accidents have occurred in each of three consecutive years;

b) Each accident involved personal injury and/or at least $100 property damage;

c) A less restrictive form of control with adequate enforcement and observance has been tried for a period of at least six months.

Preventable accidents are those involving traffic which under signalized conditions would move on completely different phases. Accidents resulting from drunkenness, icy roads and deliberate disregard of existing controls, or those between vehicles which would move on the same phase cannot be prevented by signals and should not be counted. Less restrictive measures which should be tried before signals are installed include the erection of warning signs, the provision, of safety or channelizing islands, the improvement of street lighting, and the prohibition of parking and/or turns.

The installation of traffic control signals will seldom be justified on the accident warrant alone and it should be remembered that their operation may even increase the intersection accident rate due to rear-end collisions, etc., caused directly or indirectly by the signal operation.

B 2.03

TABLE 3
PROBABLE PERCENTAGE OF VEHICLES DELAYED AT A SIGNALIZED INTERSECTION

Sum of the Equivalent Hourly Volume in the Heavy Direction on All Other Signal Phases	Percentage of Vehicles Delayed on any Approach when the Equivalent Hourly Volume entering the intersection from that Approach is											
	50	100	150	200	250	300	350	400	450	500	550	600
200	54	55	55	55	—	—	—	—	—	—	—	—
250	59	57	57	57	58	—	—	—	—	—	—	—
300	61	59	59	58	60	59	—	—	—	—	—	—
350	63	61	61	60	62	61	60	—	—	—	—	—
400	64	63	62	62	64	63	62	62	—	—	—	—
450	66	64	64	64	66	65	65	64	65	—	—	—
500	68	66	66	66	68	67	67	66	67	66	—	—
550	70	68	68	68	70	69	69	68	69	68	69	—
600	72	70	70	70	72	71	71	70	71	71	71	71
650	73	72	72	72	74	73	73	73	74	73	74	73
700	75	73	74	74	76	75	75	75	76	75	76	75
750	77	75	75	76	78	77	77	77	78	78	79	78
800	79	77	77	77	80	79	79	79	80	80	81	80
850	81	79	79	79	82	81	81	81	83	82	83	83
900	82	81	81	81	84	84	83	83	85	85	86	85
950	84	82	83	83	86	86	86	85	87	87	88	88
1000	86	84	85	85	88	88	88	88	89	89	91	90

NOTE

(a) This table is based on the relationship

$$Ds = \frac{69.43\ (1440 + Vet - Vex)}{(2000 - Vex)}$$

Where

Ds is the percentage of vehicles delayed on Phase X.

Vet is the sum of the equivalent hourly volume in the heavy direction on all other phases.

Vex is the equivalent hourly volume in the heavy direction on Phase X.

(b) Equivalent hourly volume is given by

$$Ve = \frac{(V + 0.54 + 0.6L)}{N}$$

Where

V is the total approach volume in the heavy direction.

H is the number of heavy trucks and transit vehicles.

L is the number of left-turning vehicles.

N is the number of usable traffic lanes.

The final chapter to be approved was that of Signs. The colour coding system was adopted for use as well as a greatly increased use of symbols. Some of the signs that show a distinct change to symbolization are; turn prohibition, keep right, school, pedestrian, signals ahead and clearance. Most signs that have been changed from a written message to a symbolized message will have the written message shown on a small plate beneath the sign for an interim period.

In effect the new turn prohibition signs take the positive approach of showing the motorist what he may do rather than stress what he may not. The permissible movements are shown by black arrows on a white background with a green circle around the arrows.

The school sign posed a large problem until agreement was reached on the point that it did not belong in any of the basic sign groupings, and therefore deserved its own shape and colour. The shape selected is reminiscent of the shape of the old style one room school house. The colour selected was

SCHOOL AHEAD

P-1

blue. For a symbol it was decided to use the walking boy and girl, (the boy assisting the girl across the roadway.) The response to this sign across Canada was instantaneous and is already approaching u n i v e r s a l acceptance which, I think you will agree is somewhat unique for a school sign.

Of considerable interest to Canadians was the adoption of a Trans-Canada Highway Route Marker. It is a green shield with a white Maple Leaf in the centre. In most of the provinces the Trans-Canada Highway follows one particular numbered route and thus this new marker is used instead of a Provincial marker. In the case of the Province of Ontario the Trans-Canada Highway follows sections of various numbered routes and thus the marker acts as a supplementary marker.

There is a section under the Signs Chapter covering the basic Civil Defense highways signs.

An innovation in the Canadian Manual that has received considerable favourable comment is the schedule of signs. This is an 11 page summary of the signs listing: identification number; message; dimensions; colours; and a reference to the section of the manual where full details can be found.

We now have a Manual in Canada. There are good indications that the Manual will be accepted. In fact several provinces are now studying the Manual with the idea of prescribing its use through regulations under their Highway Traffic Act.

The Traffic Engineers involved in this undertaking would probably not be criticized if they sat back and took it easy for a while. This, however, is not the situation. At the present time plans are being formulated to ensure that the proper machinery is developed so that the Manual will be constantly kept up to date. The key to this organization will probably be the Research Sub-Committee who will be charged with the task of "proving" the value of *any* recommendation for a change in the Manual.

The Canadian Good Roads Association is handling the distribution of the Manual which came off the presses in February 1960. The purchase price of $3.75, which is actually less than cost, includes all revisions as they are produced. The manual has been printed in loose leaf form to facilitate these revisions. In addition full scale drawings of the various standards are available from the C.G.R.A.

POSITIONS AVAILABLE

(Continued from page 32)

CONSULTING FIRM

Position: Planning Engineer—for interesting and demanding work on comprehensive engineering and economic investigations for the planning of industrial, commercial and residential developments, transportation facilities and major civil works. Opportunity for diversified experience and progressively increasing responsibility with consulting engineering firm (New York City).

Requirements: Graduate civil engineer with education and experience in traffic engineering. Prefer at least 5 years responsible experience in diversified aspects of engineering and planning projects. Applicant must have ability to express complex problems and solutions in concise written reports of professional character. Include complete personal resume, availability and salary requirements in first letter.

Salary: Open

Apply: Box 615, c/o ITE Headquarters.

NO TURNS
R-12

ROUTE MARKER
M-1

NO LEFT TURN
R-9

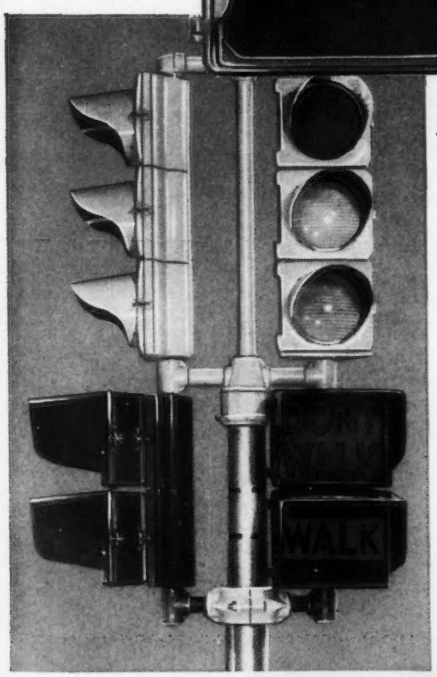
KEEP RIGHT
R-20

SIGNAL AHEAD
W-15

VERTICAL CLEARANCE
W-25

CROSSWALK
P-6

New CROUSE/HINDS INCANDESCENT Pedestrian Traffic Signal MP-120



- **Larger . . . brighter . . . more readable**
- **37% more effective lens area . . . 9″ x 11″ prismatic lens**
- **Ideal for crossings 50′ - 60′ wide**

Ideally suited to residential areas, school crossings, small shopping centers, etc., the MP-120 offers significant savings over more expensive neon units designed for crossings up to 125′ in width.

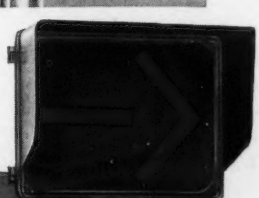
The "Walk/Don't Walk" legends and the rectangular shape of the signal distinguish it instantly as a signal for pedestrians . . . impossible to confuse with circular signals for vehicular traffic.

Simple in design, modern in appearance, the MP-120 mounts with standard signal brackets, without special fittings. Arrow indicators, in place of "Walk/Don't Walk" legends, are available for multiple-street vehicular indications.

For engineering and service assistance, Crouse/Hinds maintains a nationwide network of sales engineers and distributors to assist you in engineering and service situations. For the name of the Crouse/Hinds representative nearest you, call or write any branch office.

ABOVE — MP-120 Installed on Standard Signal

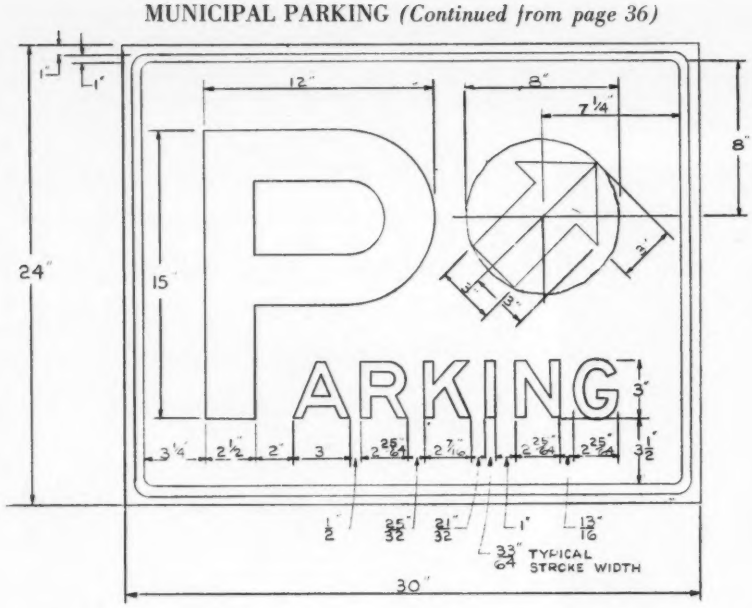
RIGHT—Arrow for Vehicular Use MP-110



WRITE for Bulletin #2716 containing complete information and specifications on the MP-120 Pedestrian Traffic Signal today.

CROUSE HINDS
SYRACUSE NEW YORK

Offices: Atlanta, Baton Rouge, Birmingham, Boston, Buffalo, Charlotte, Chicago, Cincinnati, Cleveland, Corpus Christi, Dallas, Denver, Detroit, Houston, Indianapolis, Kansas City, Los Angeles, Milwaukee, New Orleans, New York, Omaha, Philadelphia, Pittsburgh, Portland, Oregon, St. Louis, St. Paul, Salt Lake City, San Francisco, Seattle, Tulsa, Washington. Resident Representatives: Albany, Baltimore, Reading, Pa., Richmond, Va.
Crouse-Hinds Company of Canada, Ltd., Toronto, Ont.



BASIC LETTER & SIGN DIMENSIONS - SERIES 'E' LETTERS

"29-5. That member cities and state leagues comprising the membership of the American Municipal Association adopt the use of a standard directional sign directing the motorist to the location of off-street parking facilities wherever and whenever the use of such directional signs shall be determined and authorized by the local municipality.

"The recommended standard for such signs as developed by the Committee on Parking of the American Municipal Association and adopted by it at its meeting of November 29, 1959 in Denver, Colorado, shall be as follows:

"Legend shall read 'Parking' with the letter 'P' being five (5) times larger than the remaining letters and a directional arrow in the upper right hand corner.

"Sign shall be rectangular with green lettering on a white field.

"Letters shall be Series 'E' type as specified by the United States Bureau of Public Roads."

Figure 1 is a drawing of the recommended "lead-in" sign and Figure 2 is a dimensional drawing for sign painters' needs.

Most of the A.M.A. members interested or actively involved in Off-Street Parking Facilities readily acknowledged the need for directional or lead-in signing in order to insure maximum use of the facility. They also express their desire to see some uniformity in the signing in order to serve the traveling public. There seems little need to point out the desirability of such signs to merchants or Chamber of Commerce groups.

It was the Committee's desire that as many cities as possible begin using this sign so that its multiplied use will make it easily recognizable by the American motorist.

Letter to the Editor

27th April 1960

Sir:

I read with amusement the "Impressions of European Traffic" by Henry A. Barnes, Baltimore Traffic Engineer, in the February issue of Traffic Engineering.

Some paragraphs are quite exact, some are pleasant. As to the remarks Mr. Barnes makes, and the advice he gives, I will only consider that which concerns Paris, leaving to my colleagues from abroad the onus of answering on behalf of their own country, if they wish to do it.

Mr. Barnes' Parisian impressions appear unfortunately somewhat shallow, and his advice or criticisms do not take sufficiently into account a number of characteristics of European cities and European traffic, which make probably almost impossible (certainly not possible without modifications) the adoption of American practice in traffic.

a) First of all, the width of most of our streets, and of the footpaths, is much smaller than in the States, thus reducing considerably the facilities for traffic control, and the visibility. In particular, we almost never have the possibility to widen the roadway near the intersection, to make an "estuaire" which would increase the output of the crossing.

b) In our cities, and particularly in Paris, we have a lot of big intersections with five, six or seven streets, where the establishment of progressive signals is evidently very difficult. This is a problem completely different of these in your regularly chequered towns.

c) Along the same street, we frequently meet different widths (due to historical reasons), which make it very hard to carry out a nice flexible progressive system.

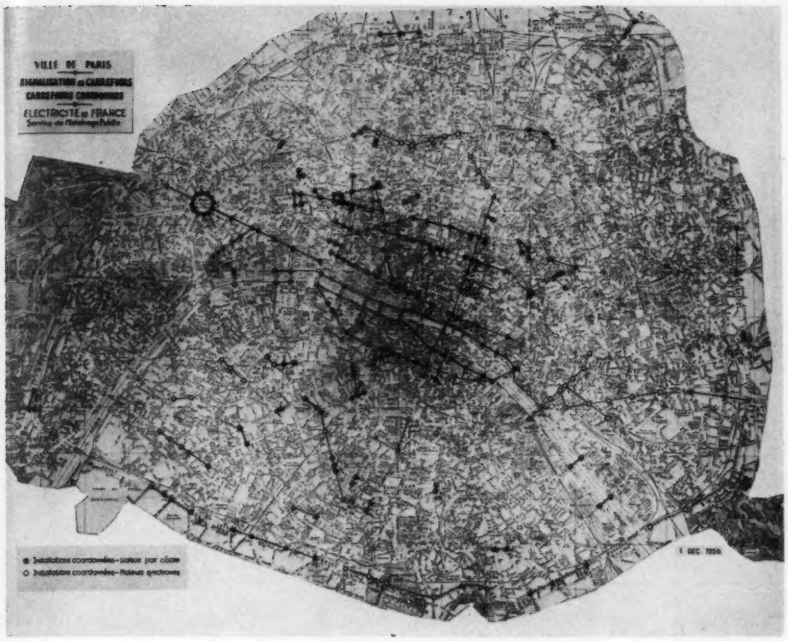
d) A great proportion of Parisian districts is full of historically interesting buildings and places, where the Town Commissioner would never be allowed to destroy or modify the structures which impede good traffic (as you so frequently and easily do in your unhistorical towns).

e) The narrowness of our roadways is not the most important obstacle. The composition of the traffic stream has not in Europe the same homogeneity as in your country, where an overwhelming majority of cars are 7 feet wide, and 18 feet long, and where the "two-wheels" practically do not exist.

On the contrary, we have cars of about all sizes (down to miniature ones) and, also we have *a lot* of two-wheels, either motorcycles, or scooters, and some bicycles. These generally are undisciplined, and abuse of the gymkana driving (still worse than our taxi-drivers' cork-screw driving . . .), does not facilitate correct driving for cars, and reduces the efficiency of painted lines.

Certainly some other differences exist between Parisian and American circumstances—above all is the lack of funds.

In spite of all this, Mr. Barnes' assertion that the traffic in Paris is unbelievably slow is *absolutely false*. It is rather slow (and sometimes very slow) during peak hours in a few arteries of our central districts—but, most of the time, it is easily possible to by-pass these jams, and take advantage of the numerous coordinated itineraries (i.e. progressive ones — see map).



I had many opportunities to drive in big American cities, comparing traffic circumstances in Manhattan or Boston with those in Paris, my feeling is that we are not so far back as Mr. Barnes pretends.

L. GAYMARD
Chief Engineer,
National Electricity Board,
7 rue Antoine Bourdelle,
Paris XV°

May 6, 1960

Sir:

I'm certain most cities have the problem of keeping up with signal timing charts. It's a problem that started with the installation of the first traffic signal and has grown ever since.

Approximately three months ago the thought occurred to us that if a chart was stuck to the inside of the door, it could not be lost or misplaced. What was needed was some sort of weather-proof substance that could easily be stuck to the door and on which could be written with pencil or pen that is smear-proof.

I found in a 5 and 10¢ store a plastic paper with a preglued back. It was simple—just print the timing on the plastic, pull off the paper backing and stick it to the door. With this in mind, I obtained some of it and proceeded to make up a chart. I found after some experimentation, that for drawing lines, a common blue pencil was good and a ball point pen was excellent for printing.

I calculated the cost of the material needed for our 235 fixed time controllers and to my surprise, $1.47 would purchase all the plastic needed.

With the Director's blessing, I put a chart at 60 intersections on February 22, 1960, and to date, each is in good condition. A change in the timing can easily be made by erasing the figures on the chart and printing new ones.

Our main worry about the chart was heat. As you know, controller cabinets can get hot, so I had one of the men at the sign shop put one of the charts on metal at room temperature, place it in the baking machine and raise the temperature to about 500° Fahrenheit —this heat had no effect on the material.

We are now working on a chart that can be placed in the actuated controllers and by the end of this year, we hope to have a chart in each of these.

D. H. O'BANNON
Assistant Traffic Engineer,
Louisville Department of
Traffic Engineering

CHESTNUT	NO'TH WALK	SOUTH WALK	AMBER	6TH	EAST WALK	WEST WALK	AMBER	OFFSET	CYCLE
45%	18	32	50	50%	68	77	95	98	60
46%	15	35	50	50%	65	85	96	98	70

PHASE A		2ND STREET		PHASE B		HILL STREET	
MINIMUM	ACTUATIONS	INCREASE	CARRYOVER	MINIMUM	ACTUATIONS	INCREASE	CARRYOVER
15 Sec.	10 cars	1 Sec	50%	15 Sec	10 Cars	1 Sec	50%
PASSAGE	MAXIMUM	AMBER	RECALL	PASSAGE	MAXIMUM	AMBER	RECALL
11 Sec	30 Sec	3 Sec	Off	10 Sec	25 Sec	3 Sec	Off
GAP	GAP	GAP		GAP	GAP	GAP	
3 Sec	3 Sec	3 Sec		3 Sec	3 Sec	3 Sec	
TIME WAIT	CARS WAIT	DENSITY		TIME WAIT	CARS WAIT	DENSITY	
30 Sec	15 Cars	15 Sec		25 Sec	15 Cars	15 Sec	

Dear Sir:

We in the Oregon State Highway Department, like all others in the profession, have been interested in the possible effect of 12-inch traffic signal lenses in the prevention of rear-end and violation type accidents at signalized intersections. Several years ago we replaced the existing 8-inch red, yellow, and green lenses, directed to main street traffic at two suburban intersections, with 12-inch lenses. The results in terms of "Before" and "After" accidents of a type which might have been prevented by the more prominent signal indication are as shown in Table I.

Table I

	Eugene[1]		*Milwaukie*[2]	
Collision Type	*"B"*	*"A"*	*"B"*	*"A"*
Angle	4	3	—	—
Rear-End	33	30	19	16
Sideswipe Overtaking	1	1	4	1
Turning	4	3	—	2
Non-Collision	1	—	—	—
Fixed Object	—	1	—	1
Pedestrian	—	1	—	—
Total	43	39	23	20

1 21 months coverage in each period.
2 38 months coverage in each period.
"B"—Before
"A"—After

If the accidents which occurred in the "after" period are adjusted for changes in traffic volume, the over-all reduction would be 21 per cent at Eugene and 17 per cent at Milwaukie. This reduction is much less than we had desired and does not indicate that the larger lenses are of any greater value insofar as the prevention of accidents is concerned. We had about 20,000 ADT at Milwaukie on US99E and 11,000 ADT at Eugene on US99.

Very truly yours,
Val P. Johnson
Traffic Control Engineer
Oregon State Highway Department

CITY OF LOS ANGELES TRAFFIC ENGINEER

$755 to $940 Month

Engrg. college grad. with 5 yrs. prof. engrg. exper. 4 yrs. of which must have been in traffic engrg.; 2 yrs. at supervisory level.

—o—

TRAFFIC ENGINEER ASSOC.

$641 to $797 Month

Engrg. college grad. with 3 yrs. engrg. exper. 2 yrs. of which must have been in traffic field. A Calif. registered Engineer receives $677 to $842 Mo.

—o—

Applicants outside the So. Calif. area need not come to Los Angeles prior to appointment.

Write immediately to Civil Service Dept., Room 5, City Hall, Los Angeles 12, Calif.

MA 4-5211, Ext. 2442

The Institute of Traffic Engineers

cordially invites

all traffic engineers

and

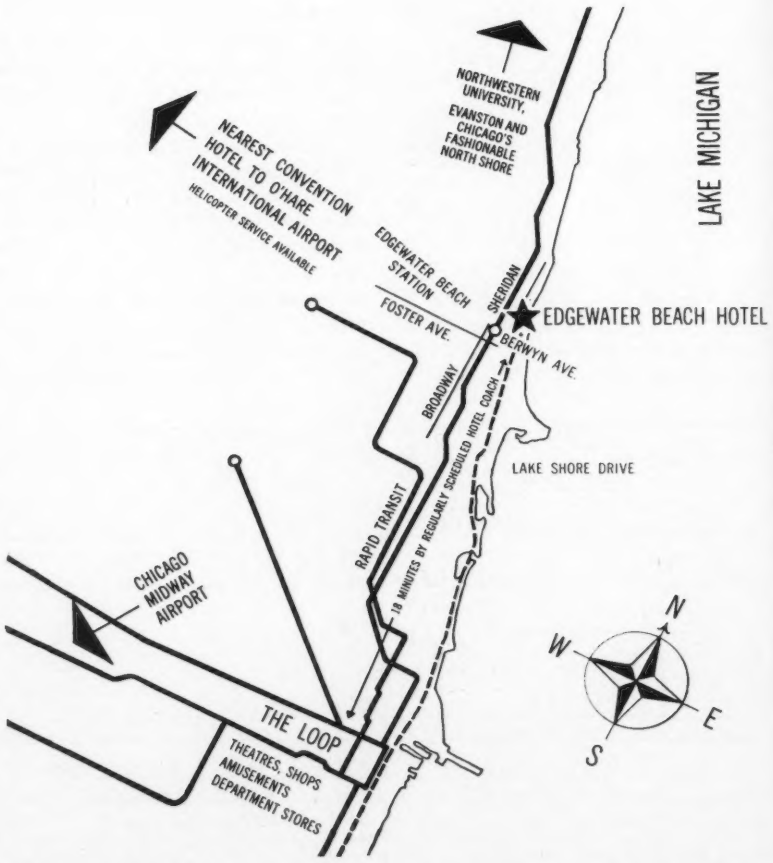
all those interested in traffic engineering

to the

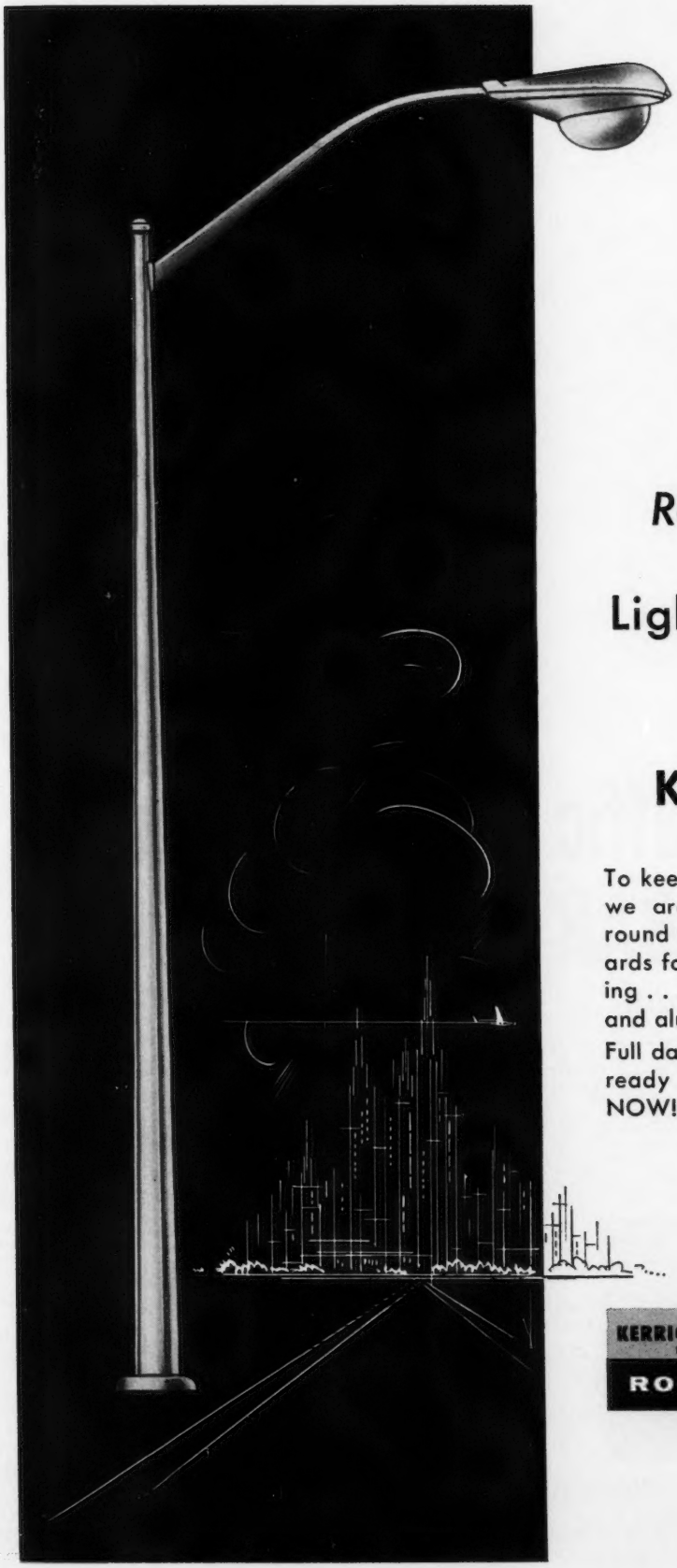
30th Annual Meeting of the Institute of Traffic Engineers

September 12 to 15, 1960

Edgewater Beach Hotel, Chicago, Illinois



The Edgewater Beach Hotel is located on Chicago's Northside—easily reached from O'Hare field or downtown.



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Seamless Round Tapered Aluminum Lighting Standards

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To keep pace with the growing market, we are now manufacturing seamless round tapered aluminum lighting standards for street, highway and area lighting . . . . . in addition to our line of steel and aluminum octagonal shafts.

Full data catalog for the new line will be ready soon, Reserve your FREE copy NOW!

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Yearbook Changes

ANTHONY, Floyd L. (Associate)
Regional Design Engineer, U. S. Bureau of Public Roads, 2938 East 92nd Street, Chicago 17, Illinois. BAport 1-4300.

BAULE, Charles L. (Junior)
Civil Engineer, LaCrosse Dredging Corp., 140 South Dearborn Street, Chicago 3, Illinois. SEND MAIL: 175 West 17th St., Dubuque, Iowa.

BENNETT, Richard Clarke (Junior)
Traffic Engineer, Traffic Planning Division, Bureau of Traffic Engineering, Room 210 District Building, Washington, D. C. NAtional 8-6000, ext. 3485.

BERGENDOFF, Raymond C. (Associate)
Project Planning Engineer, Howard, Needles, Tammen & Bergendoff, 1805 Grand Avenue, Kansas City 8, Missouri. BAltimore 1-6900.

BLACKBURN, James D. (Junior)
Traffic Engineering Department, City Hall, Des Moines, Iowa. CHerry 4-2181.

BURTON, Francis C. (Member)
Owner, Francis C. Burton & Associates, 419 Granite, N. W., Albuquerque, New Mexico. CHapel 7-1508. SEND MAIL: 519 Silver Avenue, S. W., Albuquerque, New Mexico.

CAPSHAW, Bobby Frank (Junior)
Associate Traffic Engineer, City of Albuquerque, City Hall, P. O. Box 1293, Albuquerque, New Mexico. CHapel 7-1531.

CONLEY, Richard A. (Member)
Assistant Director of Public Works, City, 402 City Hall, San Antonio, Texas. CApitol 5-5661. SEND MAIL: 422 Hartline Drive, San Antonio, Texas.

DOWNES, Donald Philip (Junior)
Assistant Traffic Engineer, Department of Traffic & Parking, City, 200 Orange Street, New Haven 10, Connecticut. LOcust 2-0151, ext. 396. SEND MAIL: 68 Bassett Street, New Haven, Connecticut.

GRIFFITH, Lincoln E. (Associate)
Traffic Engineer IV, Bureau of Street Traffic, Room 709, City Hall, Chicago 2, Illinois. BOulevard 8-9265. SEND MAIL: 4134 West 24th Place, Chicago 23, Illinois.

GIBSON, Arthur C. (Associate)
Secretary to the Mayor, City of Detroit, 1126 City-County Building, Detroit 26, Michigan. VEnice 9-6393.

GLAZE, C. K. (Associate)
Principal Planning Engineer, Washington State Dept. of Highways, Olympia, Washington. FLeetwood 7-3241. SEND MAIL: 222 Ash Street, Olympia, Washington.

Hawkins Traffic SAFETI-BAR

NEW EPOXY ADHESIVE WORKS MIRACLES

Concepts evolving from use of jiggle-bars are often misunderstood. Barriers, damaging obstacles and pre-cast curbs which throw vehicles out of control have no engineering factors. A true jiggle-bar CONTROLS, GUIDES. PROTECTS and is a step TOWARD SAFETY.
PROTECTING a TRAFFIC SIGN with DEATH is not an Engineering feat.

Write for Illustrated Circular

MANY USES:—"Safeti-Bars" are your "best bet" for protecting safety islands, preventing dangerous left turns, centerlining narrow bridges and tunnels, marking and channelizing parking lots, etc.

EASILY INSTALLED:—No pins required with Epoxy Adhesive. Removeable type mastic and pins also available for temporary installations. Bars are enameled Aluminum; available with reflective coating optional.

HAWKINS - HAWKINS CO., INC.
Traffic Safety Devices
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Planning and Research Engineer, Municipal Roads Branch, Dept. of Highways of Ontario, c/o East Block, Parliament Buildings, Toronto, Ontario, Canada. CHerry 4-2571.

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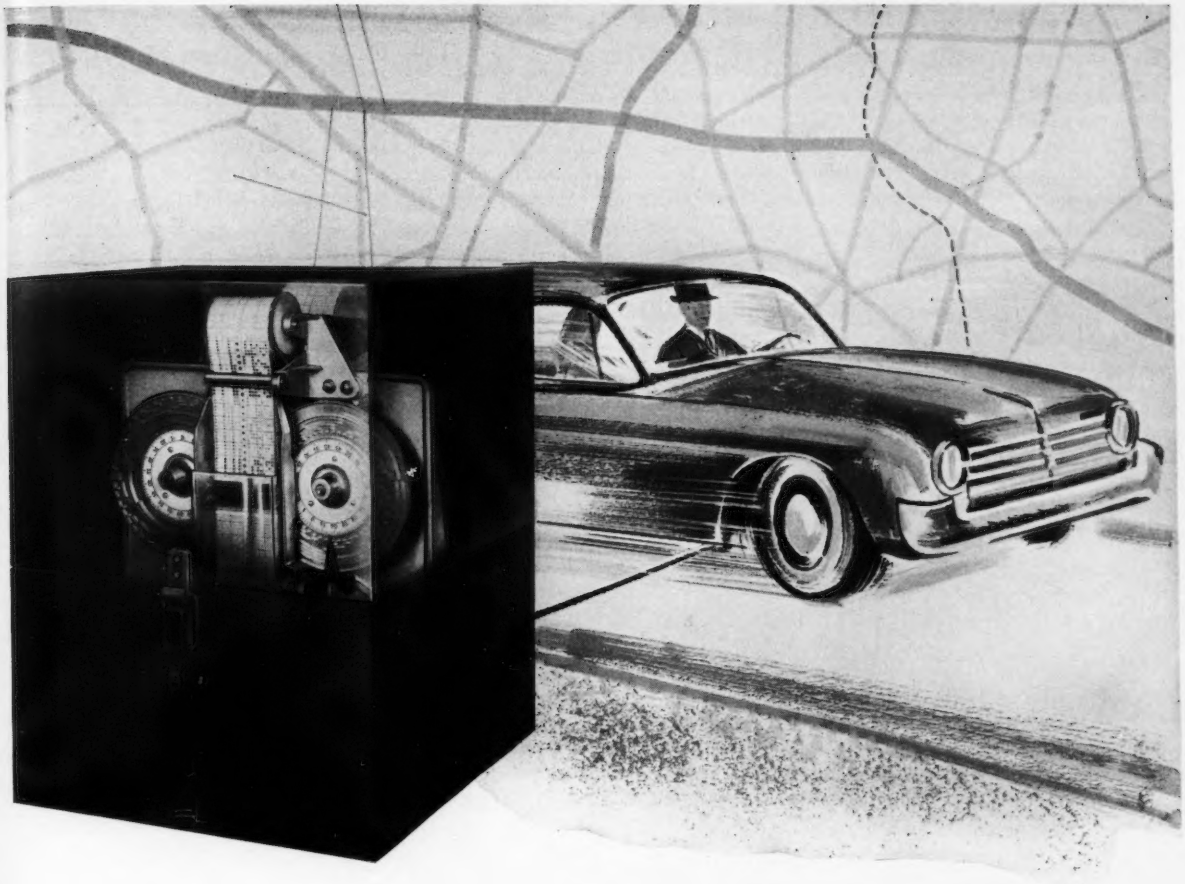

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Section News

OHIO SECTION

Officers elected June 11, 1960: President—Robert E. Holaday; Vice President—Thomas E. Young; Secretary-Treasurer—Robert J. Kelly, Room 400, 1404 E. Ninth Street, Cleveland 14, Ohio.

WASHINGTON (D. C.) SECTION

Officers elected June 16, 1960: President—William L. Carson; Secretary-Treasurer—Robert A. Keith, 8721 Jones Mill Road, North Chevy Chase 15, Maryland.

FLORIDA SECTION

Don Brammer reported on the traffic engineering short course held in Atlanta May 18-20. The state of Florida had the best representation at the course with ten members attending: Aristotle Ares—Miami Beach; Don Brammer—Coral Gables; Arthur Chancey—Clearwater; Harold Gerry—Orlando; John Habben—Tampa; Frank Hustin—Lakeland; Blaine Le-

MEMBERSHIP APPLICATIONS

The Institute of Traffic Engineers welcomes applications from qualified traffic engineers, but does not desire as members persons who are unqualified. Listed below are the names of those from whom applications for membership or transfer in grade have been received since the last published list. Institute members are urged to review this as soon as possible and immediately inform the Executive Secretary's office if names of people are found who are known to be unqualified for ITE membership or transfer.

New Applications

ARGUE, Alan Edward
Assistant Engineer, Route Analysis—Ontario Department of Highways, Parliament Buildings, Toronto, Ontario, Canada—for ASSOCIATE.

BRITTSAN, Ralph Moore
Assistant Highway Engineer—California Division of Highways, 1976 E. Charter Way, Stockton, California—for ASSOCIATE.

BURNHAM, Archie Chisholm, Jr.
Highway Engineer—Georgia Highway Department, No. 2 Capitol Square, Atlanta 3, Georgia—for JUNIOR.

FIESER, Garland Edward
Chief Design Engineer—Traffic Control Division, Eagle Signal Co., a Division of The Gamewell Company, 202-20th Street, Moline, Illinois—for ASSOCIATE.

KELLOGG, Royal J.
Chief Engineer—California State Automobile Association, 150 Van Ness Avenue, San Francisco, California—for ASSOCIATE.

McCAULEY, Lt. Col. Clark Richard
Chief, Highways for National Defense Division—Office of Chief of Transportation, Department of the Army, Building T-7, Washington 25, D.C.—for ASSOCIATE.

NORDFELT, Charles Raymond
District Traffic Engineer—California Division of Highways, 150 Oak Street, San Francisco, California—for ASSOCIATE.

STAFFORD, William Douglas
Engineer, Grade III—Main Roads Department, Traffic Engineering Branch, Malcolm Street, Perth, Western Australia—for ASSOCIATE.

SUTTERFIELD, G. Wayne
Signal Engineer—City, Room 327 City Hall, St. Louis, Missouri—for ASSOCIATE.

WILSON, Laurence
Associate Planner—Office of City Engineer, Transportation & Traffic Engineer, City, Food & Beverage Building, Balboa Park, San Diego 1, California—for JUNIOR.

WOGLOM, James Russell
Assistant Director City Planning Division—Morris Knowles Incorporated, 1312 Park Building, Pittsburgh 22, Pennsylvania—for ASSOCIATE

Applications for Transfer

ARMSTRONG, William James
Engineer of Urban Plans and Traffic—Urban Highway Department, Kansas Highway Commission, State Office Building, Topeka, Kansas—for ASSOCIATE.

CONRAD, Paul Ernest
Associate Engineer (Manager New Haven Office)—Wilbur Smith and Associates, 495 Orange Street, New Haven, Connecticut—for ASSOCIATE.

DECKER, James D.
Highway Research Engineer—Virginia Department of Highways, Virginia Council of Highway Investigation & Research, Box 3817, University Station, Charlottesville, Virginia—for ASSOCIATE.

DUGAN, Dale Edwin
Special Assignments Engineer—Highway Planning Department, State Highway Commission of Kansas, State Office Building, Topeka, Kansas—for ASSOCIATE.

GRIMM, Vincent Earl, Jr.
Traffic Engineer—City of Miami, 3343 Pan American Drive, Miami, Florida—for ASSOCIATE.

HARRISON, Billy John
Assistant to Traffic Engineer (Engineer II)—City Traffic Engineering Department, 263 West Tenth, Fort Worth 2, Texas—for ASSOCIATE.

WHITESIDE, Robert Erwin
Associate Traffic Engineer—Wilbur Smith & Associates, 495 Orange Street, New Haven, Connecticut—for ASSOCIATE.

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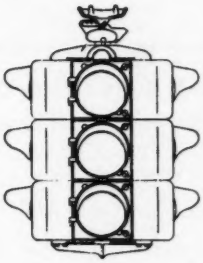
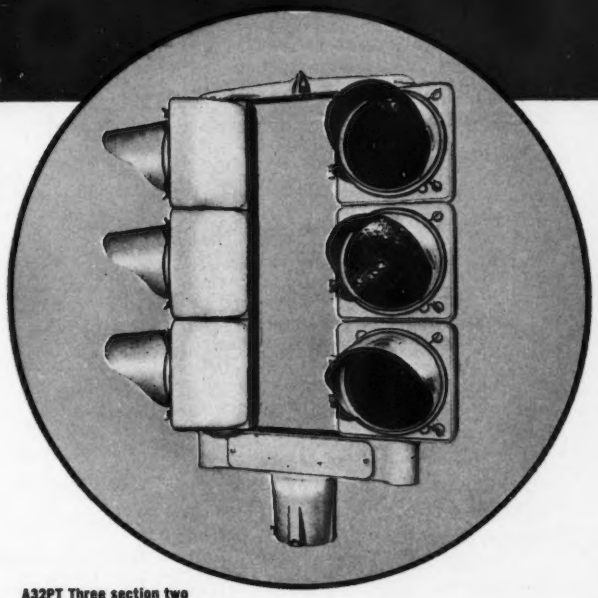


A33SW Three section three way span wire mounting



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Couris—Clearwater; Aubrey Ort—Clearwater; Charles Peterson—Panama City; Calvin Schuler — Miami Beach.

The speakers for the program, Mr. Tom Seals, Traffic Consultant and Director of the Florida Program, and Mr. Adrian Koert, Traffic Engineer, were introduced. The program constituted a discussion of the current study of Florida accidents by the Insurance Institute for Highway Safety. There was a unanimous vote in support of this study.

MISSOURI VALLEY SECTION

A most successful annual meeting was held at Columbia, Missouri, May 10, 1960, in conjunction with the Twelfth Annual Traffic Engineering Conference, which featured a technical and very informative "Freeway Operations Seminar." This meeting was well attended and considered one of our best MOVITE meetings.

The Board of Direction was very interested and understanding in regard to local Section problems and explained that most of our comments and problems were similar to those they had been discussing and seeking solutions to during the past three days of their Board of Directors meeting.

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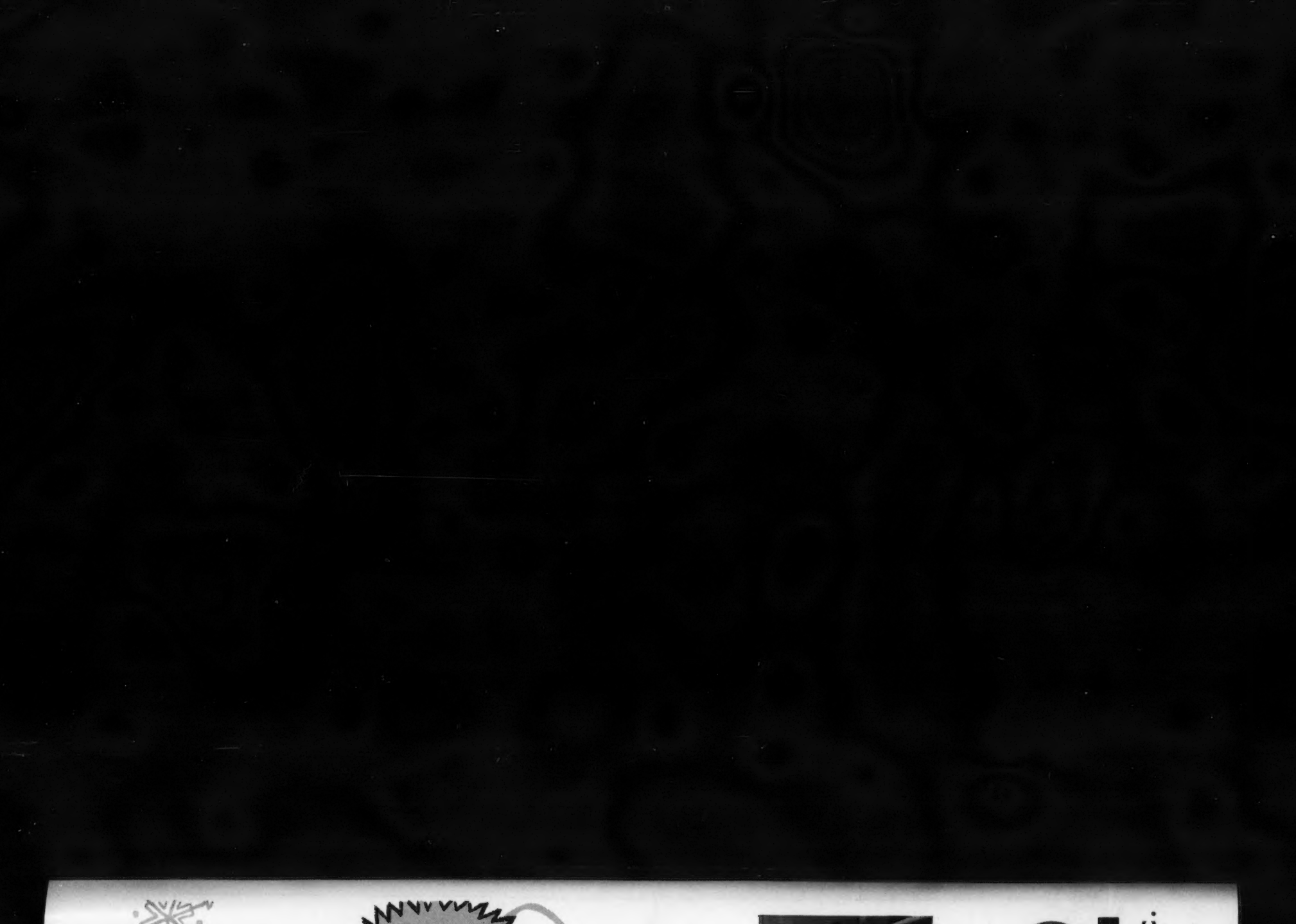
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